FEBRUARY 7, 1958

electronics

business edition

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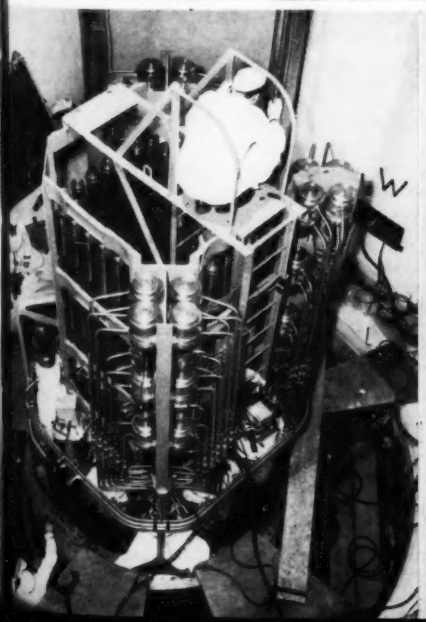
What's Ahead in Bombers?

At least a dozen firms make major electronic systems for new B-58 . . . p 13



Reactor Goes On-Stream

Electronic instruments have crucial role in Shippingport power plant . . p 22

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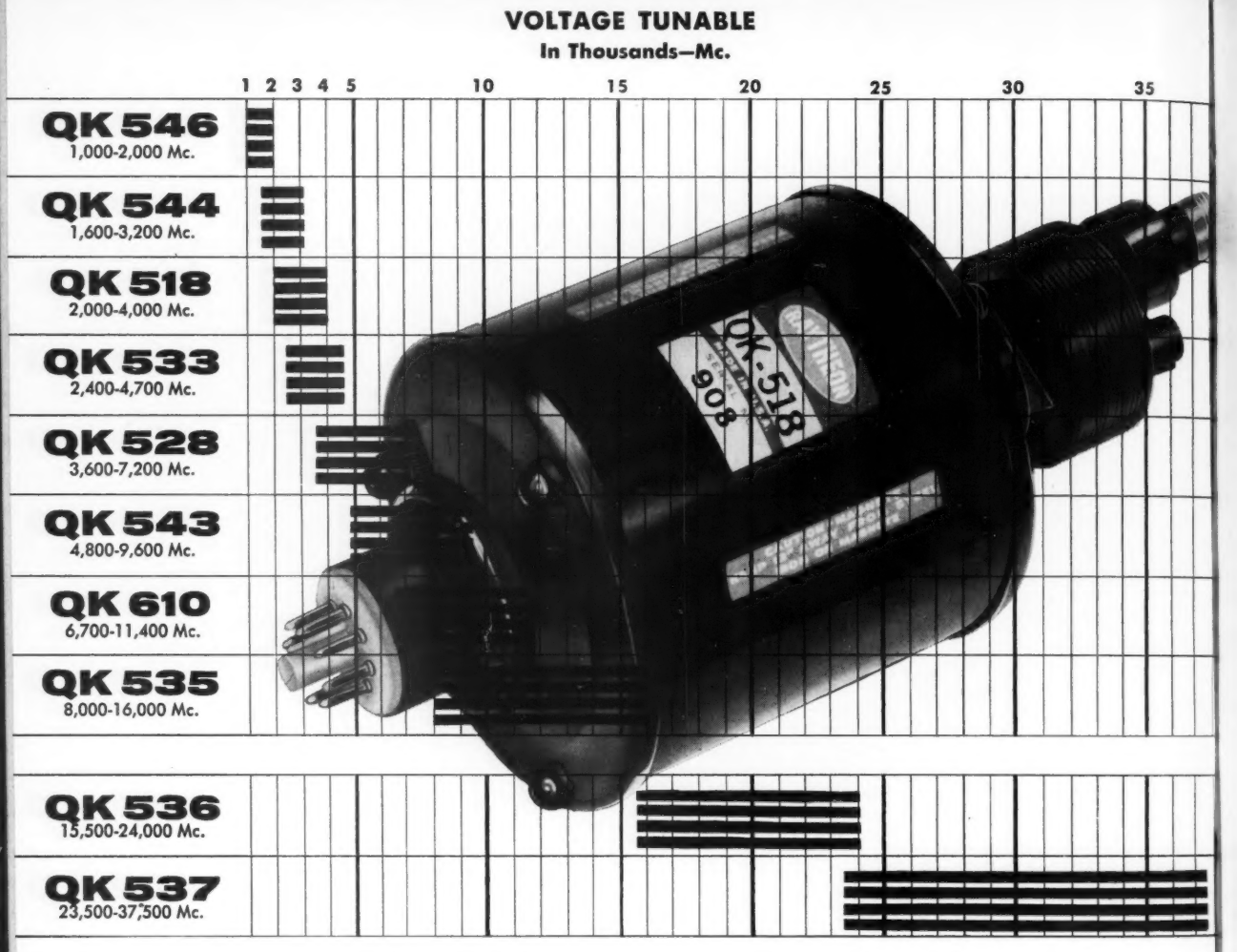

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A McGRAW-HILL PUBLICATION • VOL. 31, NO. 6 • FEB. 7, 1958

ISSUE AT A GLANCE

Researching Spreads. Electronics firms now trying to develop more non-defense business find reliable market data essential.....p 5

Shares and Prices.....p 5

Mergers, Acquisitions and Finance.....p 6

Figures of the Week.....p 6

Washington Outlook.....p 8

Executives in the News.....p 10

Comment.....p 10

Bombers: Present and Future. Hypersonic manned vehicles, like the X-15 slated for test late this year, may be the decisive weapons of the future.....p 13

The Budget and Us. Here's how the government will spend $3.7 billion for electronics in fiscal 1959.....p 15

Production and Sales.....p 16

Oscilloscopes Check Cars. One new bonanza for electronics firms is no further away than the corner garage.....p 17

EE Grads to Increase 20%. This June, a record group of seniors and graduate students will be ready for industry. Will industry be ready for them?.....p 19

What's in Those Reports? At least three reports on what's wrong with our defense planning are currently circulating in Washington. Their general tone gives clue to new policies.....p 20

A Reactor Goes On-Stream. New 60,000-kw Shippingport reactor is one in a series of atomic power plants, all will need instruments, controls.....p 22

Engineering Report.....p 25

Real "Thinking Machines" on the Way?
Technical Digest
Whiskers Provide Low-Temp Data
Phone Conversations Are Digitized
Ultrasonic Unit Photographs Arm
Automatic Radio Repeater Station
Meanwhile, Back at the Ranch
Meetings Ahead

DIGEST CONTINUED ON NEXT PAGE

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DIGEST continued

Components and Materials.....p 28
Copper Hits Bottom
New Plastic Output Soars
Firm Closes Tv Tube Factory

Agency Unifies Space Work. Brand new Advanced Research Projects Agency will guide up-stream work for Defense Dept.....p 30

Military Electronics.....p 30

Contracts Awarded.....p 30

New Products.....p 33

New Literature of the Week.....p 41

Outlook for '58 at FCC. The Commissioners feel especially bullish about radio, forecast biggest year ever.....p 42

FCC Actions.....p 42

Station Moves and Plans.....p 42

Boom in Small Craft. Recent boat show indicates pleasure craft are mainstay of small-boat electronics.....p 44

Electronic Car Control Nears. Key U.S. highway officials discuss electronic guidance for cars and trucks.....p 44

Civil Engineers Boost Computers. Now busy with a record highway-building program, these engineers are becoming excellent customers.....p 44

Canada Tv Airs Subliminal Show. What happened when a latent image was flashed 352 times to 2.5 million viewers?.....p 45

Airplane Makers to Share Tapes. West Coast manufacturers plan to pool magnetic control tapes for their new machine tools.....p 45

Breakthrough in H-Power. British Zeta reactor points the way to practical control of fusion power, may open vast new markets to makers of controls and instruments.....p 46

Tax Effects Worry French. Right now tv sales are sagging under heavy tax load. Research projects too are in danger.....p 48

Developments Abroad.....p 48

Exports and Imports.....p 48

Plants and People.....p 50

News of Reps.....p 56

electronics

February 7, 1958 Vol. 31, No. 6

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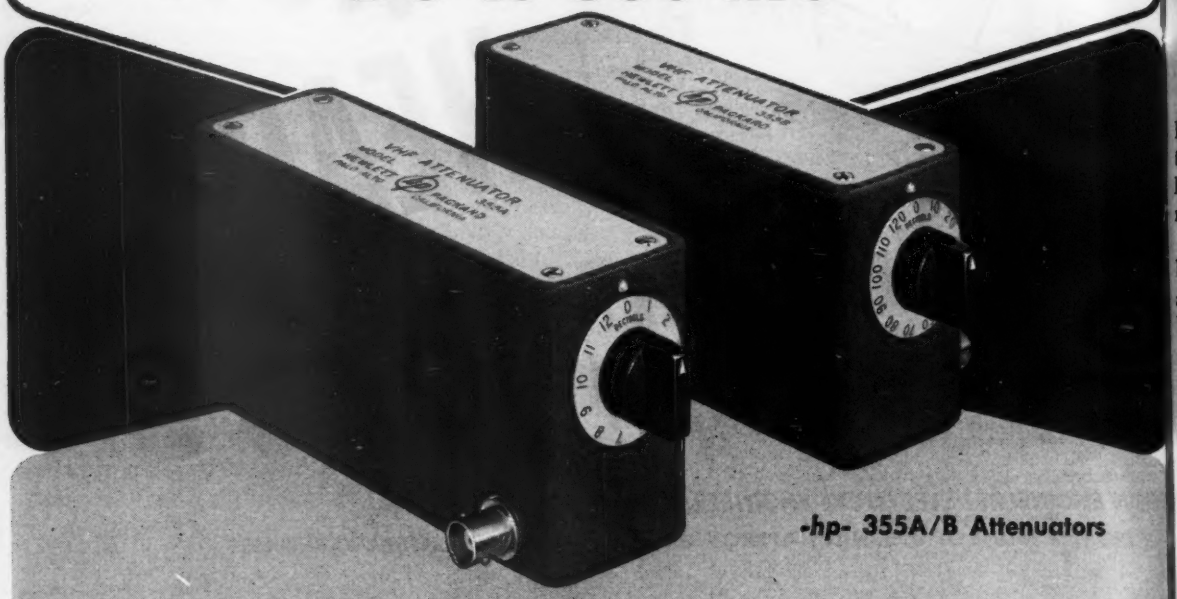

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Frequency Range: DC to 500 MC

Overall Accuracy: -*hp*- 355A, ±0.25 db, DC to 500 MC. -*hp*- 355B, ±1 db, DC to 250 MC, ±2 db, 250 to 500 MC

Nominal Impedance: 50 ohms

Maximum SWR: 1.2 to 250 MC, 1.5 to 500 MC

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Power Dissipation: 0.5 watt average; 350 v peak

Connectors: BNC

Size: 2-3/16" wide, 2-5/8" high, 6" long. Net weight 1½ pounds

Price: -*hp*- 355A, $125.00. -*hp*- 355B, $125.00

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Research Spreads

Market data is what more firms want now as they try to develop nonmilitary business

LOOK FOR MORE market research activity by electronics industry members in 1958 says Ed Altshuler, Los Angeles market research consultant and former market research manager of American Electronics.

Despite prospects for bigger than ever military business this year, electronic makers have learned a lesson from the disastrous turn taken by military business in 1957, says Altshuler. "They realize they can no longer rely on the protective umbrella of military business and must rely on their own resources."

A recent survey of electronic companies showed more and more are establishing their first market research budgets. Those already budgeting market research expenditures are increasing the amount. More firms are either employing full-time market research personnel or hiring consultants.

On the West Coast, a recent market research seminar, sponsored by the Southern California Chapter of the West Coast Electronics Manufacturer's Association, drew representatives from 35 area firms.

Factors behind the greater interest in market research are:

- The constant lack of funds problem which faces the government. Military contractors never know when a slowdown will hit them.

- Higher profit margins available on nonmilitary business. Average after tax profit on military business is four percent, says Altshuler, compared with 10 percent for nonmilitary business. Current congressional spotlight on Defense Dept. activities means more pressure on contracting officers to get more equipment for less.

- Military equipment needs are subject to rapid change. Contract backlogs of individual firms can be lost overnight, even though military business as a whole is increasing.

- There is a growing awareness of the opportunities in nonmilitary fields.

This awareness of opportunities is being translated into concentrated efforts by manufacturers to develop information about nonmilitary markets.

With the limited number of market specialists in the industry to whom manufacturers can turn, firms are using a variety of means for obtaining this data.

A few are able to use their own market research departments. Others are using outside market consultants. Still others are trying to train sales people to get a steady flow of market intelligence. Greater use is being made of engineering personnel to work with sales people on customer needs.

Military market research is developing. Establishment of key listening posts in sensitive military markets to get rapid and accurate information concerning new developments in the volatile military area is becoming increasingly popular.

SHARES and PRICES

CLOSED-CIRCUIT TELEVISION sales are still only a small fraction of the potential. Leaders in the field look for annual sales of $75 million to $100 million within the next 10 to 15 years. However, current sales are more modest. Total CCTv sales in 1957 were $5 million to $5½ million. In 1956 the figure was $3 million. Nevertheless, a number of manufacturers are growing increasingly enthusiastic about the prospects. One manufacturer, specializing in equipment for military use, budgeted 1958 sales at five times those in 1957.

Typical Closed-Circuit Tv Manufacturers	Recent Price	Dividend Rate	Percent Yield	Earned Per Common Share 1957	Period	1956	Traded	1957 Price Range
Babcock & Wilcox	32¼	1.00[2]	3.1	2.43	(9 mos)	1.84	NYSE	29–46⅞
Cohu Electronics	7¾[1]	....	...	N.A.	(year)	0.29	OTC	6½–12¾
Du Mont Labs	4	....	...	d–0.45	(6 mos)	d–0.23	ASE	3–6⅛
General Electric	61⅞	2.00	3.2	2.10	(9 mos)	1.85	NYSE	52⅜–72⅜
General Precision	36¾	2.40	6.5	2.70	(9 mos)	1.21	NYSE	30¼–47¼
IT & T	30¼	1.80	6.0	2.35	(9 mos)	2.76	NYSE	25¾–37¾
Jerrold Electronics	1⅞[1]	....	...	d–0.07	(6 mos)	d–0.04	OTC	1¾–3
Philco	13⅜	....	...	0.74	(9 mos)	0.21	NYSE	11–18⅜
RCA	34¼	1.50	4.4	1.87	(9 mos)	1.82	NYSE	27–40
Siegler	14⅞	0.80	5.4	1.36	(year)[3]	1.50	NYSE	12⅜–18
Thompson Products	53¾	1.40	2.6	3.73	(9 mos)	2.66	NYSE	46–89¾

[1] bid [2] plus stock [3] fiscal ended June 30

MERGERS, ACQUISTIONS and FINANCE

• **Raytheon Manufacturing** acquires **Applied Electronics** and its distribution outlet, **Apelco Sales,** of South San Francisco. The SF firm is a leading producer of marine communications equipment. This acquisition is a first step in Raytheon's program of acquisition and expansion in the commercial equipment field.

• **Consolidated Electrodynamics,** Pasadena, Calif., and **Cenco Instruments** of Chicago announce plans to merge through exchange of stock. Tentative exchange ratio is three shares of Cenco for one share of Consolidated. Merger plan is subject to approval of stockholders of both companies and government agencies.

Cenco makes scientific instruments, laboratory apparatus and industrial equipment. Sales last year were $14.5 million. Consolidated makes measuring and recording equipment, electronic data processing systems, industrial control devices, test instruments and high vacuum apparatus. Sales exceeded $30 million in 1957.

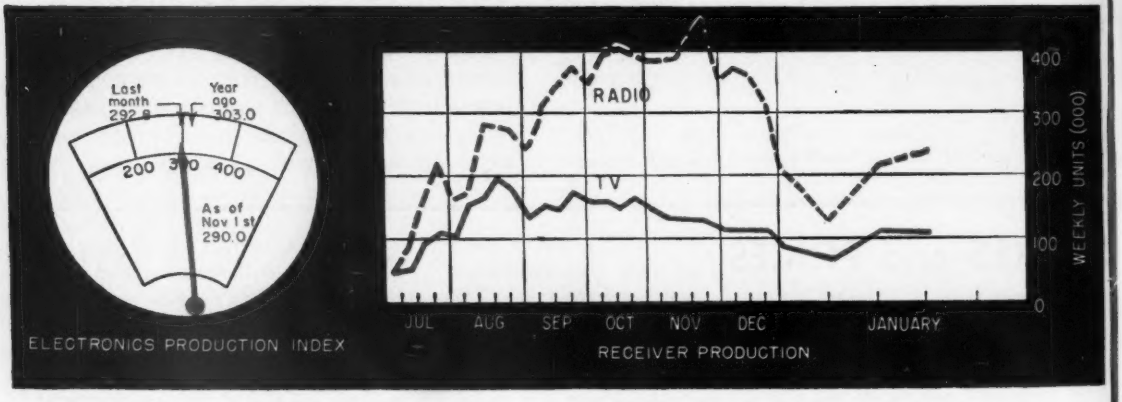
Cenco's marketing organization will help Consolidated develop new customers for its products and Consolidated's research and development organization will help Cenco to develop new electronic products.

• **Kern County Land Company,** West Coast land development organization, invests close to $1 million in newly-formed **Watkins-Johnson Company** of Palo Alto, Calif. W-J will specialize in research, development and manufacture of micro-wave tubes. KCL will own 100 percent of the new firm's Class A stock and 49 percent of the common stock. Dean A. Watkins and H. Richard Johnson, whose combined investment is $10,200, will have 51 percent of the common and voting control.

Watkins, who has been named president, is professor of electrical engineering at **Stanford** and director of its electronic tube laboratory. Johnson, named vice president, was formerly head of microwave tubes for **Hughes Research Labs.**

• **Scientific Industries** of Springfield, Mass., plans to issue $120,000 of 6 percent convertible debentures, due Feb. 1, 1968. Receipts will be used to expand laboratory and scientific instruments plant and to build up firm's new electronic division. Willis E. Burnside & Company of New York, N. Y. will be underwriter.

• **Dun & Bradstreet** is putting on its big push to get annual reports for its credit files. The giant credit agency points out that time taken by the average business man or his accountant to fill out a financial statement is saved in establishing credit relations with suppliers. The financial report is one of the important parts of a business credit report.



FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	Jan. 17, '58	Jan. 10, '58	Jan. 18, '57
Television sets, total	108,806	114,392	144,597
Radio sets, total	239,133	216,924	304,540
Auto sets	99,578	86,570	139,673

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	Jan. 22, '58	Jan. 15, '58	Jan. 23, '57
Radio-tv & electronics	44.92	44.89	47.78
Radio broadcasters	58.25	58.58	62.74

FIGURES OF THE YEAR

	1957	1956	Totals for first 11 months Percent Change
Receiving tube sales	428,688,000	429,846,000	— 0.3
Transistor production	25,965,000	11,232,000	+131.2
Cathode-ray tube sales	9,076,982	10,191,545	— 10.9
Television set production	5,825,804	6,760,045	— 13.8
Radio set production	13,634,402	12,266,591	+ 11.2

LATEST MONTHLY FIGURES

EMPLOYMENT AND PAYROLLS

(Source: Bur. Labor Statistics)	Oct. '57	Sept. '57	Oct. '56
Prod. workers, comm. equip.	412,000-p	417,900-r	413,100
Av. wkly. earnings, comm.	$76.44 -p	$78.40 -r	$78.12
Av. wkly. earnings, radio	$74.40 -p	$76.02 -r	$75.70
Av. wkly. hours, comm.	39.0 -p	40.0 -r	40.9
Av. wkly. hours, radio	39.0 -p	39.8 -r	40.7

TRANSISTOR SALES

(Source: EIA)	Nov. '57	Oct. '57	Nov. '56
Unit sales	3,578,700	3,544,000	1,829,000
Value	$6,989,000	$7,075,000	$5,559,000

TUBE SALES

(Source: EIA)	Nov. '57	Oct. '57	Nov. '56
Receiving tubes, units	39,950,000	47,075,000	39,489,000
Receiving tubes, value	$33,166,000	$38,421,000	$31,476,000
Picture tubes, units	772,801	995,629	957,765
Picture tubes, value	$15,138,438	$19,495,574	$16,014,839

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. . . compared with 5 to 7 kc for conventional transistors
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at 1.2 w output

For high-speed switching:

(TYPE CTP 1135)

POWER DISSIPATION = 10 WATTS
at 70°C base temperature
DC CURRENT GAIN = 40 minimum
at 0.5 amp
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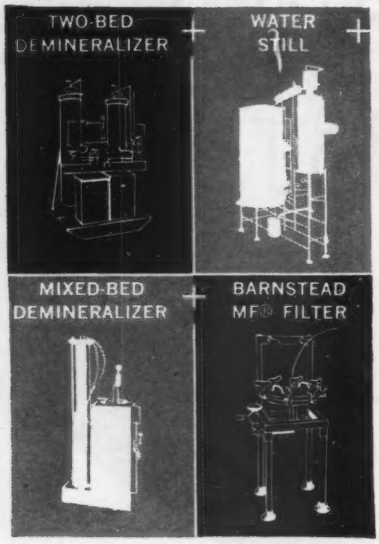

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NEW: TRANSISTOR WASHER

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WASHINGTON OUTLOOK

YOU CAN COUNT on the Federal Communications Commission going ahead with its plans for approval of pay tv.

Congressional committees—mainly led by Chairman Oren Harris of the House Interstate Commerce Committee—are still pecking away at the whole idea. There's likely to be a move made to put Congress on record against any tests at all. This would be led by Congressman Celler of the House Judiciary Committee, but no such move is likely to succeed.

The betting is almost 100 percent that the FCC will go ahead after its March 1 deadline for submission of plans for large-scale pay tv tests. So far, the biggest pay tv interests have held off filing their plans with the Commission—but this is only because they don't want to tip their hand. They'll all be in just before the deadline.

● **Disregard all the talk** about creation of a new Department of Science. One proposal is to lump together in such a new shop these agencies: Atomic Energy Commission, National Science Foundation, Patent Office, Bureau of Standards, and the Commerce Department's Office of Technical Services.

But as of now the top scientists and administrators inside the Administration are (See p 25) against it. They have more immediate scientific and technical problems to cope with now, without taking on something as controversial as this.

The problem of reorganizing the Pentagon—which spends billions of dollars each year on R&D (See p 15)—will blot out any serious attempt toward a new civilian science agency.

● **Navy has plans** for a third-generation air-to-air missile to be called Eagle. The new missile will be a successor to Sparrow 3, an air-to-air missile produced by Raytheon which is guided by a radar homing device. Sparrow 3, in turn, is a successor to Sparrow 1 produced by Sperry and guided by a beam rider. Eagle will be a longer range missile than the other two and will carry an atomic warhead. One company known to be bidding Eagle: American Bosch Arma.

● **Defense Secy. McElroy** has authorized the Navy to set up range instrumentation for a new Pacific Missile Range (PMR) for launching of long-range ballistic missiles. The range will run from the Pt. Mugu–Lompoc, Calif. area, some 50 miles northwest of Los Angeles, out into the Pacific. First stage of the range will cover 1,500 miles, falling short of Hawaii; second stage will run to 5,500 miles, with the impact area near Midway. Costs for PMR will total about $150-million through 1963.

Navy has already ordered eleven FPS-16 long-range, high-precision radars from RCA for equipping the new range.

PMR will be used for training both Air Force and Navy ballistic missile launching crews, and will not duplicate facilities at the Air Force's test range running over 5,500 miles from Cape Canaveral, Fla., to Ascension Island in the South Atlantic.

The Canaveral range will be used only for R&D flights. The range's firing schedule is so heavily crowded that there won't be enough facilities there to handle training of missile crews. The Pacific range will not be as heavily instrumented as Canaveral for it will be launching ballistic missiles already tested out in Florida.

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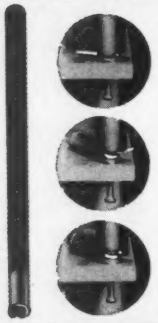

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EXECUTIVES IN THE NEWS

Brooks: at the crossroads

NEW YEAR marks a crossroads for John G. Brooks, president of the Siegler Corp. The firm he took over at yearend 1954 had multiplied its sales twelve-fold, had become too big to be small, was still too small to be big. From a family-held company making space heaters it had become 63 percent electronic, growing to one of the top ten suppliers of missile electronics. New contracts with missilemaker Martin Co. consolidates the firm's foothold in our industry. And on Jan. 2, a week before Brooks' 45th birthday, Siegler stock went on the big board.

Midwesterner Brooks went to work at 17 as an office boy for Commonwealth Edison of Chicago, while he studied nights at Northwestern University. In 1936, Zenith's Commander E. F. MacDonald hired him as his secretary. By the time the war came along, he had become sales supervisor of Zenith's Distributing Corp.

The war put him in the Air Corps, where he rose to captain. When he finally parked the uniform, he was firmly decided on a sales career went to work as merchandising manager for Majestic Radio's Chicago distribution arm. Then he spent seven years with Ekco Products winding up sales v-p in 1954.

Close associates see him as a "master salesman". Behind that, Brooks is really an affable sort of guy with a quiet, incisive humor that can see the funny side of most things. A busy life has cut his sporting interests to the bone. He still gets away for deepsea or freshwater fishing with his wife, whom he met several thousand feet in the air on the plane for which she was stewardess. At his Santa Ana, Calif. home, Brooks enjoys keeping up with his sons (9 and 7 years old), reads a lot for business, almost as much for relaxation.

COMMENT

Computer Progress

Since ELECTRONICS reflects a well-informed grasp of the electronics business and is considered an authoritative publication, I am sure that you will welcome my calling to your attention an unfortunate connotation.

The article "More Computer Progress" (Jan. 10, p 16) presents a review of the Eastern Joint Computer Conference in Washington. On p 17, you state "Indications of rank-thining among general-purpose analog manufacturers was pointed up when Goodyear announced discontinuance of the GEDA." Our statement dated Dec. 6 says "Goodyear Aircraft Corporation will devote the full capability of the GEDA engineer

ing organization to the design and manufacture of special-purpose computing systems and large-scale digitally controlled analog computing systems."

In your abbreviated version there is an implication that we will no longer manufacture GEDA analog computers. Actually, we anticipate that the sale and utilization of GEDA analog computing equipment will continue to increase during the coming years.

Our purpose in issuing our statement was to formally advise industry of our shift in emphasis: from standard off-the-shelf computers to special-purpose large-scale systems under digital control.

R. J. Lowry
Goodyear Aircraft Corp.
Akron, Ohio

Error in Magnitude

Kudos on your Washington preview "What's Ahead in 1958" (Jan. 24, p 22). It provides some light to lead through the fog that's floating over the Potomac.

But isn't there an error of magnitude in your statement "electronic goods will account for about one-third of the military hardware dollar"?

G. A. Burke
Alexandria, Va.

Some, but not as much as you might think. Very conservative evaluations put the figure at about 16 cents on the dollar right now. With added missiles allocations, it'll probably rise within the year to 20 cents on the dollar. We qualified our figure with the remark "As defense production plans shape up now;" that's admittedly a little futuristic.

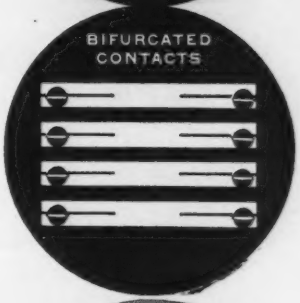
Metal Wire

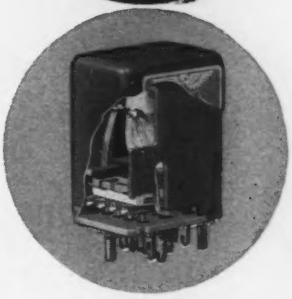
In (New Products, Nov. 10'57, p 44) under key 82, you state "Precious metal wire for resistant windings are announced by J. M. Ney Co. with resistivities of 80 and 20 ohms per circular mil foot." This is not so. Resistivities are 80 and 200 ohms per cmf.

Dexter B. Peck
Peck-Adams, Inc.
Hartford, Conn.

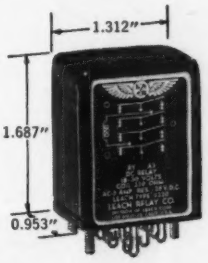
LEACH

balanced armature relays help you solve electronic circuit problems





First proven in all types of advanced aircraft, Leach *Balanced Armature* relays are now solving the most exacting problems for systems designers. Exclusive balanced armature design eliminates faulty operation of contacts due to vibration and shock forces. Bifurcated contacts assure high reliability in contact-making circuits. You'll find that these unique relays outperform all other types in resistance to shock, acceleration and vibration.



9220... Balanced Armature relay. Rectangular configuration...with a variety of mountings and terminals available. Hermetic sealing is 100% tested by mass spectrometer.

Typical Ratings

Normal operating voltages–6-115 vdc, 115 vac (400 cycle), 4 PDT.
Contact ratings @ 28 vdc or 115 vac single-phase
Resistive – 3 amp @ 120°C
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Inductive – 1.5 amp @ 85°-120°C
Motor Load – 1.5 amp @ 85°-120°C
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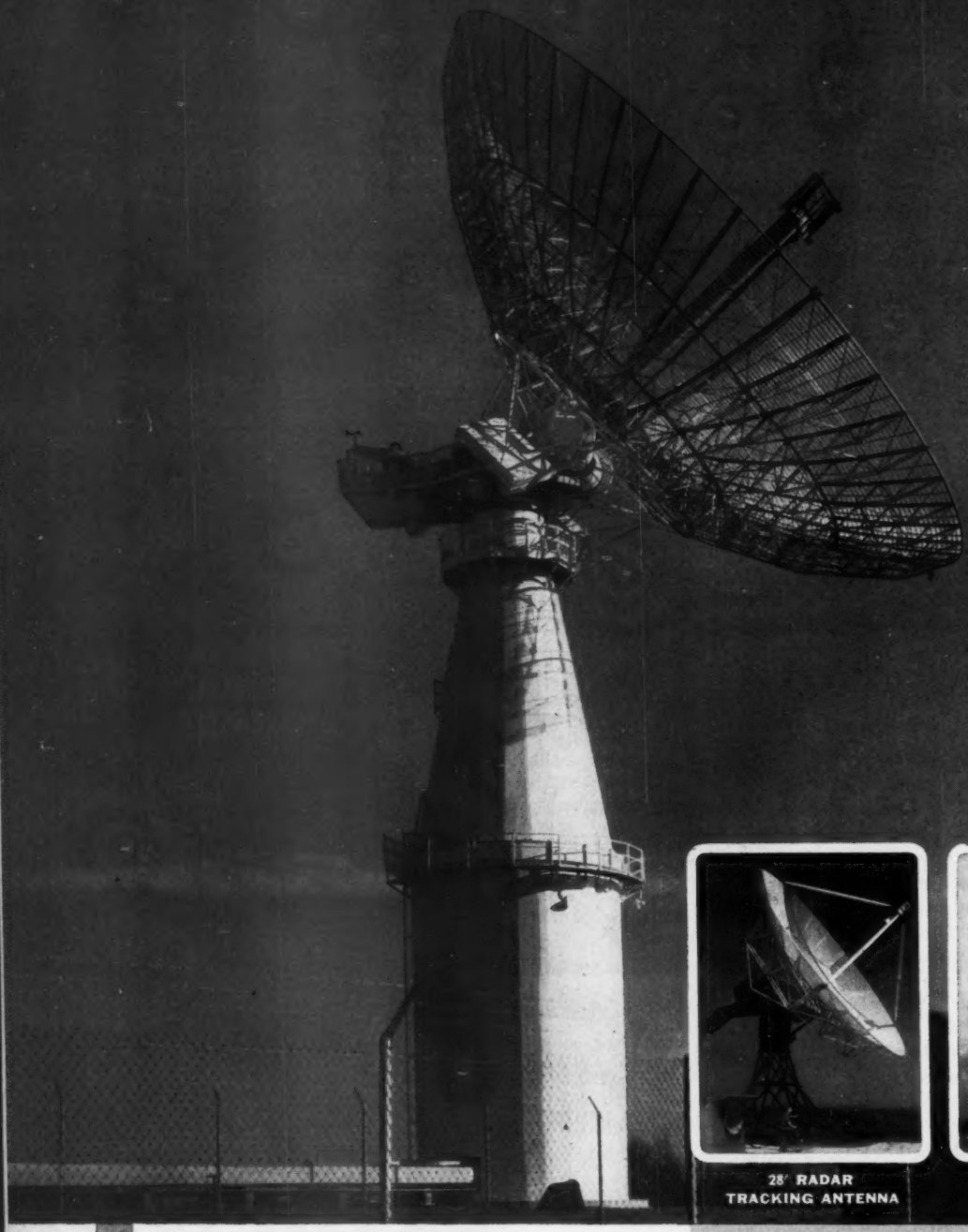

28′ RADAR
TRACKING ANTENNA

60′ TELEMETRY
TRACKING ANTENNA

TOWERING 90 feet above the New England countryside at Westford, Mass., this giant 84′ tracking antenna is part of a new, long-range radar installation now studying problems in ballistics missile defense.

Equipped with an elevation-azimuth type mount designed and fabricated in cooperation with M. I. T.'s Lincoln Laboratory, the big dish can make a full 360° horizontal sweep and has a vertical rotating capability of 90°. Like all Kennedy steerable antennas, it features a light weight, aluminum dish supported by a steel pedestal mounted on a concrete base.

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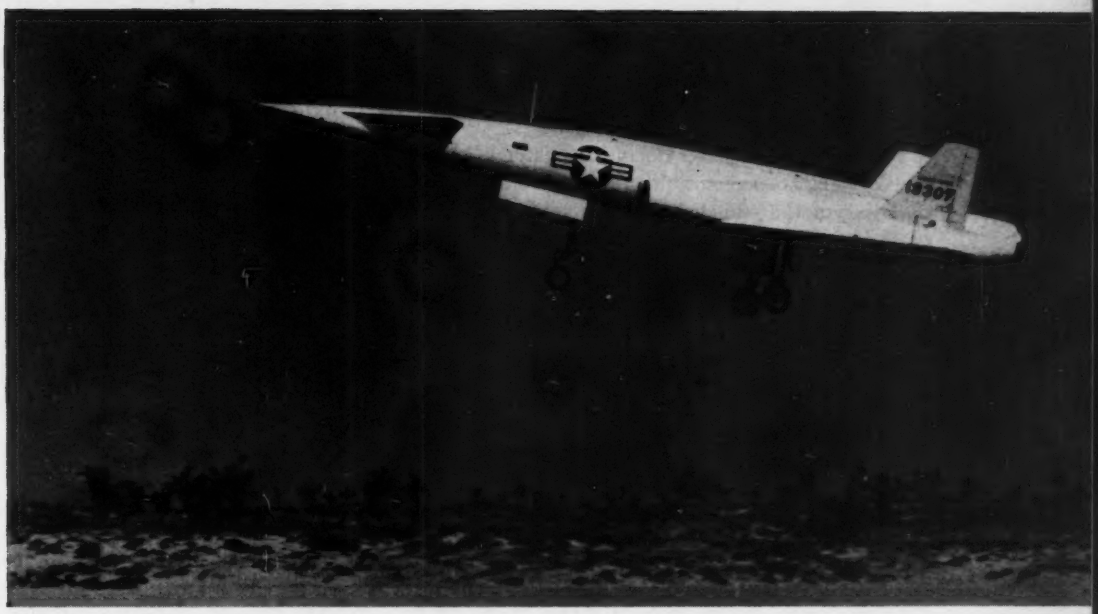


Design of North American's X-10 (shown landing above), unmanned test vehicle for the Navaho guided missile, "was helpful" in designing the new WS-110A manned bomber

Bombers: Present and Future

"For any predictable time, the hypersonic, manned vehicle will be the decisive weapon in any future war." Reason for this is: "In general, robots are too logical. Their reaction is predictable; they are easier to intercept."

So SAID Major Alexander de Seversky before the Senate Preparedness Subcommittee.

This appraisal may, in part, also reflect Pentagon thinking. USAF's estimated expenditures for fiscal 1959 are two to one in favor of aircraft over missiles: $4.970 billion for aircraft and $2.112 billion for missiles. This amounts to $1.7 and $1 billion, respectively, for electronics.

Although one reason for emphasis on aircraft is to fill the gap with planes until missiles are operational, there is also an operational advantage. A "human" computer has judgment. A man can carry out change of missile plans better than a missile.

Recognition of the value of manned aircraft is borne out by a look at the large portion of the estimated spending for aircraft not scheduled to be operational until **after** ballistic missiles are available in quantity production.

Three of these planes are the B-58 (which will run a close production race with Thor and Jupiter), the WS-110A and the plane that ultimately will evolve from the X-15 experiments.

Mission capabilities of these aircraft are competitive with those of ballistic missiles. In some special circumstances they might be strategically more effective than missiles.

Advanced planes such as these, plus those already operational in SAC, TAC and CONAD and their

accompanying cargo ships and tankers, represent a gigantic business for the electronics industry.

USAF is planning for 105 wings with an aircraft inventory of 20,843 by the end of fiscal 1959.

Here is a rundown on the current status—development-, production-, and business-wise—of USAF's bombers.

• **B-47:** Though now out of production, (the B-58 will eventually replace the 6-jet B-47), SAC's 28 wings of 45 B-47's each, are a continual source of business for the electronics industry.

Producers of the B-47, Boeing and later Lockheed and Douglas, expect sizable contracts for continued updating of the plane. Lockheed thinks 25 percent of modification work on B-47 to be done at the Marietta plant in 1959 will be for electronics.

USAF may alter 350-400 more B-47's with new communications, countermeasures gear in '58.

Other business created by the B-47 are contracts for conversion to reconnaissance and hurricane research missions, switch to toss bombing systems. There will continue to be big business in new test, checkout and ground handling equipment.

• **B-52:** Although eventually to be replaced by the new WS-110A, this 8-jet bomber is still active under current contract. Gen. White said last September that USAF would have 11 wings of 45 planes each. 108 extras against attrition will bring the total to 603. Estimated at $8 million per plane, this comes to $4.824 billion. With support equipment costing at least another $1.5 billion, total procurement will reach $6.324 billion.

At 15 per month, the last plane should leave Boeing's Wichita plant about November 15, 1959.

Additional work on B-52's already operational with SAC will continue. Philco recently got a $1,329,960 contract with AMC for modification kits for the APS-64 radar sets.

IBM is prime contractor for the AN/ASQ-38 bombing-navigation system. Heart of the system is IBM's AN/ASB-4 which consists of bomb-nav computers, Raytheon bombing radar and IBM radar presentation. Ancillary equipment: GPL Doppler radar APN-89, Kollsman astro compass, Kearfott true heading indicator, and GE X-Ray div. radar scope recording camera.

• **B-58:** Research, development and production of the 4-jet B-58 Hustler (see cover) comprises almost an industry in itself. Convair, in charge of weapons system responsibility, commissioned 16 companies to produce major items and subsystems. More than 20,000 firms in all 48 states are in the program.

Forty-one percent of the total cost goes for electronics. Eighty percent of the engineers working on the B-58 are electronics engineers.

Current status: 15 B-58's are now flying. A total of 77 have been ordered.

Major electronics producers are: Sperry—navigation and bombing system, Sylvania—counter measures, Fairchild Camera and Instrument—photo-reconnaissance system, Bendix Radio div.—civil navigation aids, Emerson—active defense system, Eclipse Pioneer div. of Bendix—autopilot and power control, Westinghouse—alternator-constant speed drive, Melpar—reconnaissance system components, Advance Industries—indirect bomb-damage assessment system, and Magnavox—air-to-air and air-to-ground communications system.

• **WS-110A: North American's** WS-110A bomber is expected to be the next step beyond the B-58 in SAC manned-weapons progress. It will fly at Mach 3 speeds above 70,000 ft. altitude.

The 110A is currently in the research and early development stage. Wind-tunnel testing, which began even prior to notification by the Defense Dept. that North American had won the design competition, has been accelerated.

Though design details are classified, it is known that North American's work on the X-10 test missile and the F-107 Mach 2 fighter "was helpful."

Guidance system will be stellar-inertial auto navigation, designated ASQ-28 (ELECTRONICS, Jan. 31, '58). Prime contractor of the ASQ-28 is IBM. Autonetics div. of North American will supply, under subcontract to IBM, the star-tracker portion of the system. The N2J star tracker is similar to the N2C and N2F developed by Autonetics under the Navaho and Snark programs. Completed system will be government furnished to North American.

• **X-15:** North American's X-15 rocket-powered aircraft will in itself not bring the quantity of business that the WS-110A or B-58 will. The X-15 is a research plane. Only three may be built.

Principal mission is to explore the effects of heat on structure, fuel and internal systems. The vehicle is supposed to carry a man above 100 miles at speeds past 4,000 mph.

The developmental flights will be local. Therefore no inertial or other long-range navigation will be required. No bombing or ECM equipment will be installed. Data derived from the experiments, however, are expected to bring forth large-scale programs, requiring ECM, navigational and fire-control equipment in the future.

Main business now is test gear, both airborne and ground, data reduction and telemetering gear.

• **Nuclear-powered aircraft:** Among firms working on these planes are Lockheed, Convair, Boeing and North American (ELECTRONICS, Dec. 13, '57).

WASHINGTON PREVIEW—II

The Budget and Us

Right now, Congress is in an open-handed mood. The Armed Services have asked for $3.7 billion to spend for electronics in fiscal 1959. They will probably get every cent they ask for—and maybe more. Here's how they plan to spend their electronics dollars

WASHINGTON—The Administration's record peacetime budget for fiscal 1959 now before the Congress, sets out plans for a continuing high level of military electronics production and research.

I—The Budget at a Glance

New appropriation requests for electronic procurement total $3.7 billion. This includes $1.5 billion for aircraft electronics, $1.1 billion for missile electronics, $117 million for shipborne electronics and $1 billion for communications gear and other equipment.

Actual spending for electronic equipment will remain approximately at this year's $3.7-billion level. But deliveries of aircraft electronic equipment will drop from $1.9 billion this year to $1.7 billion.

Spending for military electronic research and development will rise from about $450 million to over $500 million.

New orders for military electronic equipment will remain close to this year's $4.2 billion.

II—New Ideas

The budget includes an unprecedented request for Pentagon authority to transfer up to $2 billion in funds from one service to another.

Advanced Research Projects Agency, just set up to direct overall development of the ballistic-missile defense system, reconnaissance satellites, space vehicles and platforms will have its own budget next year.

For fiscal 1958, a supplemental appropriation request of $10 million is pending to get ARPA under way. For fiscal 1959, $350 million is sought—half for antimissile work, half for space projects. The budget estimates that ARPA's expenditures will total $199.1 million next year.

A large chunk of new funds for military hardware will go into the new ballistic-missile detection system and for extension of SAGE, Missilemaster and frequency-diversity radars.

The Air Force estimates that the ballistic-missile detection system will cost $721 million. Congress is now studying a supplemental appropriation request for fiscal 1958 which includes $329 million to get the system under way (enough for three sites) and $29 million for SAGE.

RCA has been named overall systems contractor on the ballistic-missile detection project. GE and Western Electric will also play major parts.

III—The Contract-Award Picture

Army will place $1.6 billion worth of overall hardware procurement contracts next year; $758.2 million will go for missiles and ammunition, including electronic gear. Some of remaining funds are earmarked for fire-control equipment, communications and ground radar.

Navy will award $4.6-billion worth of new orders. The fund covers a $1.5-billion shipbuilding program with $104.2 million set aside for electronics, procurement of $1.8 billion worth of aircraft, $37 million of ground electronics and detection gear, $270 million for Bureau of Aeronautics missiles and

Glossary of Budgetese

New obligational authority or **appropriations** includes the sums voted by Congress to agencies for financial support of government programs. **The authority to spend doesn't necessarily show up as spending during the next fiscal year.**

Obligational authority includes the total amount the spending agencies are authorized to commit to contracts from new appropriations, carry-over funds or transfers of funds, which eventually call for payment for goods and services.

Obligations include the contracts the agencies have written which commit the government to pay for delivery of goods and services.

Expenditures is the total dollar figure of checks written by the Treasury in payment for delivery of goods and services. **They reflect volume of shipments.**

drones and $371.9 million for Bureau of Ordnance missiles. The missile program will stress the Polaris IRBM (Westinghouse and GE are major electronic contractors), shipbuilding will emphasize antisubmarine warfare vessels (including submarines) and guided-missile ships.

Air Force plans to place $8.7 billion worth of new production orders. This will cover $4.9 billion in aircraft, $1.7 billion in missiles, $705.7 million in ground communications and electronics (including missile and air detection systems) and $1.4 million in airborne electronics and communications.

Production plans include funds for volume output Convair B-58's. B-52 output is now scheduled to be phased out in about 18 months, when 603 aircraft are completed. The A-plane project will continue in low gear, financed with research funds for the most part.

The Air Force wants manned bombers to supplement ICBM's even after the missiles are in quantity production. Thus the Air Force will push development of North American Aviation's so-called chemical bomber, a Mach 3 plane still on the drawing boards.

IV—New Trends in Fiscal '59

Producers who do not diversify into the new areas will drop out of the arms business.

Stress on placing production contracts with developers of new equipment will continue.

As some big prime contractors are edged out of military production, they will push into component manufacture. Result: an even tighter squeeze on small subcontractors.

Military services will continue to provide production equipment and facilities. But construction of new plants will be held down.

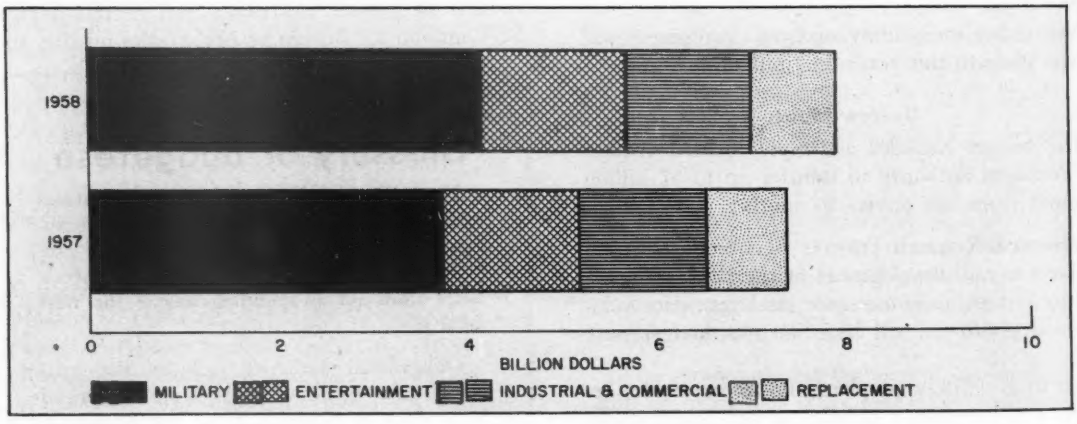
V—Other Budget Highlights

Government-supported research and development will be pushed more strongly—particularly basic research. Budget for the **National Bureau of Standards** will rise from $9.4 million to $11.5 million; for the **National Advisory Committee on Aeronautics,** from $71 million to $80.4 million; for the **National Science Foundation,** from $41.5 million to 140 million.

Civil Aeronautics Administration will obligate $142.5 million for air-navigation facilities—Vortac, long-range radar, etc.—compared to $106 million last year.

U. S. Information Agency seeks a $5 million appropriation for new radio facilities. Its fiscal 1958 appropriation was $1.1 million.

PRODUCTION and SALES



Industry Sales to Top $8 Billion in '58

FACTORY SALES of electronic industry products will top $8 billion in 1958, Don G. Mitchell, chairman and president of Sylvania Electric Produets, predicts.

This comprises estimated entertainment sales of $1,594 million, industrial and commercial sales of $1,330 million, military sales of $4,210 million and replacement parts sales of $990 million.

According to Mitchell's estimate, military business will account for 52 percent of factory sales this year, while entertainment will account for 20 percent; industrial and commercial, 16 percent and electronic replacement parts, 12 percent.

Including service and installation fees of $1,137 million, distribution revenues of $2,792 million and broadcasting revenues of $2,249 million, he said total industry revenues would be about $14¼ billion.

Mitchell also estimated total industry revenues of nearly $13¼ billion for 1957.

. . . Today auto dealers are looking to electronics for means of fast trouble shooting. Those wavy lines mean money to repairmen as . . .

Oscilloscopes Check Cars

ELECTRONICS captured the attention of the National Auto Dealers convention in Miami Beach two weeks ago. About 10,000 people there saw specially-designed oscilloscopes that simplify automotive trouble-shooting. Business-wise, insiders say, this looks like a new multi-million dollar market.

The scope displays were presented at the booths of Sun Electric Corp., Heyer Products and Allen B. DuMont. All three devices do their job by connecting to the car ignition system, and producing a display on a cathode ray tube.

The crt shows a six or eight-line pattern, depending on the engine being checked. By reading blips, an operator can quickly diagnose troubles.

A Heyer spokesman says a good mechanic can learn to use a scope "in a couple of hours."

Sun Electric says their sales efforts have been "very rewarding". Company claims people get a "big kick" out of seeing their cars checked over with an oscilloscope. "It also inspires confidence," a Sun spokesman says. "People trust the electronic display, don't feel that they're paying for something they're not getting. It makes life a lot easier for the service station operator."

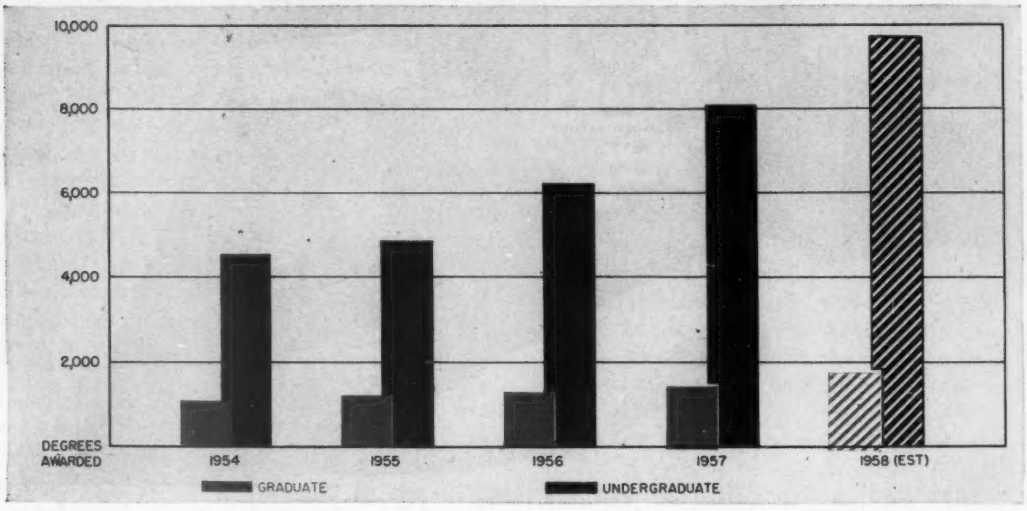
To keep its claimed 95 percent of the scope business, DuMont banks on a multiarmed line of auxiliary equipment. A number of patented attachments produced by the firm enable its equipment to perform a number of tests not possible with just the scope.

Some ailments new scopes detect: defective sparkplugs, coils, capacitors, wiring, and switching; worn distributor parts; bad timing; and faults due to preignition, noise, or combustion knock.

"The scope isn't a cure-all for car troubles," cautions a Sun Electric engineering executive. "It shows up trouble quicker than any other method, but for precise values and figures finer instrumentation is needed. As far as we're concerned, the scope should still be considered an adjunct to full-scale testing." He says, however, that the future of auto scopes looks good, both from the point of engineering and of sales.

DuMont says scopes will give the small repairman a chance to make money in the tune-up field. Says the firm, "With a few hours' training, the average mechanic can find troubles in minutes instead of spending all day tapping engine blocks and listening to noises." A DuMont spokesman sees "a market in the millions", and predicts brisk business this year.

EE Grads To Increase 20%



In June two record groups will get degrees. Seniors: 9,700, up 1,600 over a year ago. Graduates: 1,800, almost 400 more than in June, 1957. And though the first-year class total is down a bit, it's offset by more part-time and evening students

RECORD NUMBER of graduates with EE degrees will be turned out by the nation's engineering colleges this June.

Number of EE degrees to be won by the class of 1958 should exceed 9,700, some 20 percent more than last year. About 8,100 electrical engineering degrees were awarded in June, 1957, and 6,200 in June, 1956. Overall, the EE grad total has soared impressively from 4,585 in '54 to 9,700 this year—a jump of more than 100 percent.

Nearly 1,800 master's, doctorate and other post-graduate degrees will be awarded—a record. More than 1,400 graduate degrees were awarded last June and slightly less than 1,300 in June, 1956.

These projections are based on figures supplied by the Office of Education.

Fourth and fifth-year EE enrollees climbed 20 and 22 percent respectively, from 9,813 to 11,743 and from 713 to 870. Number of third-year students was up 12 percent, from 12,564 to 14,024.

Number of students preparing for graduate degrees also was up 12 percent, from 7,954 to 8,997. Number of enrollees for the master's degree last September was 7,730, up 11 percent from the previous year. Doctorate enrollees totaled 1,198, up 25.4 percent, while the 69 candidates for other post-graduate degrees exceeded 1956 by 38 percent.

Trend of future electrical engineering graduates looks less rosy after comparison of 1957 and 1956 enrollments of the second and first-year classes.

Second-year EE students in Sept. 1957 totaled 15,804, largest such class in history. But the total second-year enrollment was only 1.5 percent over the 15,570 second-year enrollment of 1956.

Record of enrollments in the first-year class was even worse. Number fell 1.4 percent over the two-year period, from 15,702 to 15,481.

The present first-year class has the distinction of being smaller than the second-year group. In the past four years the ratio of first-year to second-year enrollees has consistently declined from 111 percent in Sept. 1954, to 107 percent in 1955, 101 percent in 1956 and 98 percent in the current school year.

Number of part-time students increased 38 percent between '56 and '57, from 899 to 1,237. Evening total was up 36 percent, from 5,190 to 7,036.

There were 225 women among 66,195 undergraduate electrical engineering students in 1957. Previous year there were 157 women out of 60,294.

To keep 75,000-watt Klystron tubes operating efficiently, Eitel-McCullough specifies Monsanto's OS-45 coolant-dielectric, pumpable from —65° to 400° F.

The extreme operating conditions encountered in advanced tropo-scatter communications systems, such as DEW Line and White Alice, often require special materials for cooling the Klystron transmitting tubes. A recent application of the Eimac amplifier Klystrons specified Monsanto OS-45 as the coolant-dielectric for use in these tubes.

Engineers at Eitel-McCullough, Inc., manufacturer of Eimac power Klystrons, found that OS-45 has excellent dielectric properties and that it is one of the few dielectrics that would do the job required.

When you design or miniaturize electronic equipment, consider Monsanto OS-45. You can get helpful facts from Technical Bulletin O-123. Write for it or mail in the coupon below, today.

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Nelson Rockefeller: "a world in ferment"

Robert Sprague: "a time of crisis"

What's in Those Reports?

EVER since Sputnik, Washington has been rocking with controversy over at least three reports on the state of the nation's defenses. One of them, the so-called Gaither report, has been circulating since mid-October in its own highly restricted Washington orbit. Another, the report of Panel II of the Rockefeller Brothers Fund's special studies project, was released to the public early last month (quotes above). A third, the Killian report, is still being held close to the presidential vest.

All of the reports will color national defense policy more and more as time passes. Their significance to industry in general, and electronics in particular, is already large and still growing.

Followed through, the recommendations in the reports will mean more money for defense, more government-sponsored research and development, more Federal aid to technological education, more interallied cooperation, and a reorganization of the Defense Department and of its method of getting and spending money.

At least 16 percent of the money spent for defense hardware will filter back to electronics. That's the way the average is running now, and it's going up. With upwards of $4 billion in spending authority earmarked for missiles this coming year, the percentage will push up to above 20 cents on the dollar.

The significance goes deeper than just money coming in in defense spending or going out in taxes, though. Future trends will bring more of a challenge to technological industries, especially electronics and rocketry. There'll also be a wider public acceptance of and respect for scientists and engineers.

As Nelson Rockefeller says in his introduction to the report: "We have emerged as a strong nation in a world of ferment" but we need to reappraise "our concepts and attitudes to deal with a situation changing more rapidly and in directions different from what our national experience has led us to expect."

The Gaither committee took its name from H. Rowan Gaither, West Coast attorney who was its first chairman. During the unpublicized 6-month life of the committee, Gaither became ill; the final report was prepared under the direction of Robert C. Sprague of Sprague Electric Co. and William C. Foster of Olin Mathieson Chemical Corp., who became co-chairmen.

Meanwhile, the Rockefeller Brothers Fund had been backing a series of studies called "America at Mid-Century." The second of the seven study panels started looking at military aspects of international security in November 1956. Its report is the only one of the seven released so far.

The President's twin policy messages—State of the Union (Electronics, Jan. 24, p 22) and Budget (see p 15)—show the extent to which these reports have already influenced national policy.

The Gaither report urges that the defense budget be raised steadily to an annual peak of $46 billion by 1960. The Rockefeller panel wants annual hikes of $3 billion for the "next several" fiscal years, which would shove the figure over $50 billion by 1963.

Eisenhower has already raised defense requests by almost $2 billion, and you can bet that isn't the end.

Both reports stress the necessity for meeting challenges of both limited and all-out aggression. The budget message puts "special emphasis" on missiles and missile-related items, including nuclear submarines to launch Polaris, antimissile defenses and detection systems, ICBM launching sites.

Both reports want an overhaul in the Pentagon based on the missions the services must perform rather than on their traditional roles. Eisenhower put Pentagon reorganization "under special study;" Nelson Rockefeller and William Foster are two of the six men who will make the study.

The Rockefeller report specifically recommends "unified commands" and a single chief of staff for all U.S. forces. President's plan is aimed to provide "unified direction . . . and coordination" of military effort. He has already moved to concentrate antimissiles and satellites in one Pentagon office.

Both reports stress the necessity for pooling scientific brainpower with allies and for increasing both R&D efforts and the level of scientific education. The President has asked Congress for legislation to permit the exchange of scientific data with friendly countries. He has also asked for $1 billion in funds to aid scientific education and for a "substantial increase" in research funds.

Both reports recommend attention to the problems of civil defense. The original aim of the Gaither study shows as a recommendation to spend $5 billion annually for shelters to protect the public against radiation poisoning. The Rockefeller group states that "a start should be made without delay." The Administration has so far been silent.

Secrecy surrounding the Gaither report confuses many people, irritates some. A couple of officials familiar with both reports say there's no substantial difference between them. The President said that he was keeping the Gaither report secret just because it was submitted to him in confidence. But one top-level official who knows both reports told Electronics: "If the President thought it in the public interest to release it he would have done so."

Material in the Gaither report that's not included in the Rockefeller findings may be references to classified source data. On the other hand it may be some viewing-with-alarm that the Administration does not think warranted. In any case, the secrecy runs counter to the wishes of many government officials of both parties and of co-chairman Sprague himself. "This is a time of crisis," he says; "if the public is informed of the facts, however bad, and is shown what should be done about them, they will support their leaders' course of action."

Noise on Defense

ALTHOUGH the Gaither and Rockefeller reports may become the substance of our defense policy, they'll have to fight a lot of noise. The state of the nation's defenses is a hot topic, and everybody's got something to say.

Deputy Defense Secretary Donald Quarles says: "We can all be proud" of our missile program, which is "generally speaking . . . ahead of theirs." Our armed forces, Quarles thinks, are now in a position to make it unprofitable for anyone to attack this country, "and we have programs calculated to keep us in that position."

Adm. Arleigh Burke, Chief of Naval Operations, thinks the most serious problem is getting necessary information to the JCS. "The responsibilities of the Joint Chiefs . . . are so vital to the survival of the U. S.," Adm. Burke feels, "that they could not safely be entrusted to any group that didn't have the knowledge embodied in the chiefs of staff."

Ex-Navy chief Chester W. Nimitz thinks a single chief of staff would be "totally wrong."

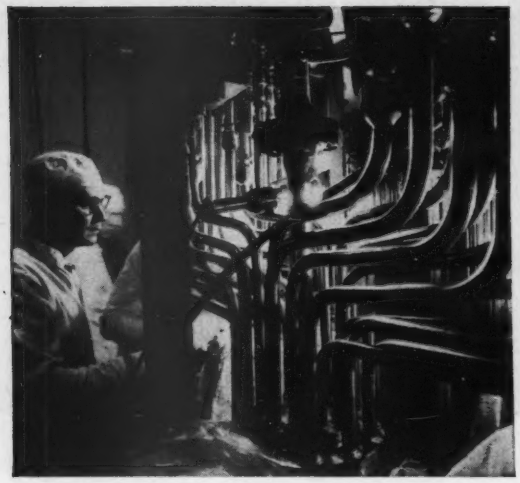
Major Gen. B. A. Schriever, USAF missleman, says "we are probably behind the Russians in the ballistic missiles program." Gen. Schriever thinks our deterrent capability is nonetheless adequate for us to catch up.

Nuclear submariner Rear Adm. Hyman Rickover feels that we'd better watch our step in the field of nuclear subs and submarine defenses.

Douglas Aircraft chairman Donald W. Douglas complains that "only a small fraction of the necessary funds" has been allocated for his firm's antimissile Zeus. He also fears that the U. S. has a major deficiency in airlift," urges more missile-toting cargo planes.

Boeing president William M. Allen criticizes the fact that there was no increase in production scheduled for the Boeing B52. Allen wants higher taxes to provide a higher level of defense spending, states "it's time the American people recognize the situation . . . I think it's critical."

Thomas G. Lanphier, v-p of General Dynamics' Convair division, feels that we're two to three years behind the Russians. Calling the Pentagon over-optimistic, he suggests that we would have trouble catching up in five years, says the USSR is nearer to reliability in weapons systems because they've tested many more parts. Convair could put "fifty times as much work, in terms of dollars," into its antimissile developments, he says.



. . . Conduits feed signals from reactor instruments to control room . . . Dispatcher sends out 60,000 kilowatts to Duquesne Light Company's customers when . . .

A Reactor Goes On-Stream

IT'S ONLY A LITTLE TOWN. Shippingport, Pa. Soon—maybe in a week—top government officials will gather there to dedicate the world's first full-scale atomic-electric generating station devoted exclusively to civilian power needs.

Shippingport is the biggest of six atomic reactors which began pumping juice in 1957. It is generating 60,000 kilowatts on its first core and a planned second core will produce 100,000 kw.

By contrast, atomic power news will seem drab during the rest of 1958 and 1959: only one smallish plant each year. Four, however, will go critical in 1960 and another dozen by the mid-1960's.

Instrumentation firms are assured of a market for at least five to 10 years by the present momentum of the $\$\frac{1}{2}$ billion a year atomic energy field. What will happen after the mid-1960's is the question.

The real nuclear news for the next few years won't be the number of plants, but signs that the cost of nuclear electricity can be brought below 10 mills a kilowatt-hour.

Cost figures for Shippingport show the magnitude of the task. An estimate of its power costs is 55 mills a kwh, compared with as low as five mills for other plants in the coal-rich areas of Pennsylvania.

Shippingport cost about $70 million to build—about $20 million more than early estimates. Around $40 million more went for R&D.

AEC footed most of the bill. Westinghouse put up $500,000 for the opportunity to build the plant. Duquesne Light Company contributed $5 million and the turbines, besides paying for the steam.

Shippingport, of course, is a prototype which was not expected to make money. It was built so that the lessons learned in its construction and operation can make subsequent reactors more economical.

There is an excellent chance that Shippingport can be operated at considerably over its design power.

The crucial tests of whether nuclear power will be competitive will come in the years after 1960 when the "first generation" of power reactors are operating.

Four plants under construction for 1960 are:

Indian Point, N. Y., 163,000 kw (nuclear portion) being built by Babcock and Wilcox for Consolidated Edison at an estimated cost of $70 million.

Dresden, Ill., 180,000 kw, by GE for Commonwealth Edison, $60 million.

Monroe, Mich., 100,000 kw, by Power Reactor Development Co., $47 million.

Rowe, Mass., 134,000 kw, by Westinghouse for

Yankee Atomic Electric, $57 million.

The first two are wholly financed by utilities. AEC is contributing $16 million to the latter two. None of them will be moneymakers.

GE figures Commonwealth Edison will get power from Dresden at 7.5 mills a kwh, based on Edison's investment of $30 million. However, a group of utilities is contributing $15 million for R&D and GE stands to go out-of-pocket $15 million.

Atomic Industrial Forum estimates that seven finished or scheduled privately-owned power reactors total $280 million in investments. In other words, capital costs are at least twice that of conventional plants.

AEC is betting that water-cooled or moderated plants will become competitive in the United States. All the reactors listed above are water except one. Monroe is a breeder reactor, one that can replenish its own fuel.

The only other big reactor definitely scheduled is a 75,000 kw sodium-graphite reactor North American Aviation will build in Nebraska. Its 6,500 kw prototype is operating now at Santa Susana, Calif.

A variety of other concepts are being investigated, including the gas-cooled type proved successful by Britain. Gas reactors are capable of 10 to 14 mills a kwh costs, tantalizingly close to being economic. In Europe, that is actually low enough.

W. Kenneth Davis, AEC reactor development director, believes water types can be operated at two or three times designed power level. Fixed costs will drop further with million-kilowatt stations and construction economies to come with experience.

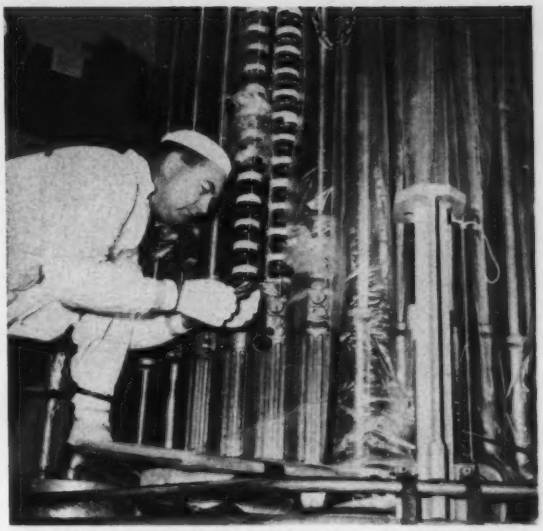
During the next 10 to 15 years, he feels, fuel costs can be halved, fuel fabricating costs quartered and fuel life extended by a factor of eight.

Experiments performed in December on an experimental water reactor at Argonne National Laboratory indicate there actually is a good chance of cheap A-power.

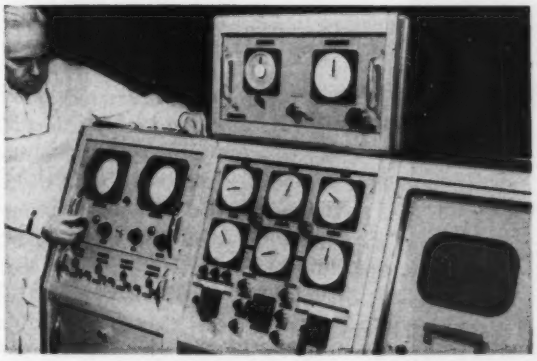
Argonne reactor's designed power is 20,000 heat kilowatts (5,000 kw). Changes in operating procedure raised its output to 50,000 heat kilowatts and 60,000 hkw is considered feasible.

Operating costs, Argonne estimates, can thus be reduced from 52 mills to 32 mills a kwh. A four-reactor power station would reduce costs to 12 mills. The catch is that Argonne has a very flexible reactor. Even so, it was a happy harbinger.

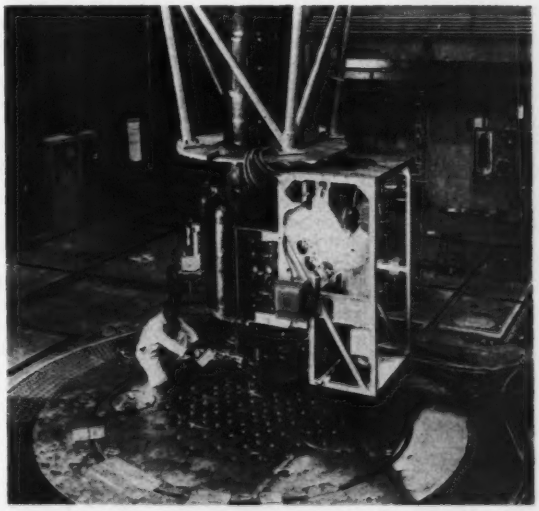
Last month, GE got permission to step up thermal output from its reactor at Vallecitos, Calif., from 20,000 to 30,000 kw. Another water reactor, it supplies steam to a 5,000 kw generator producing electricity for consumer use.



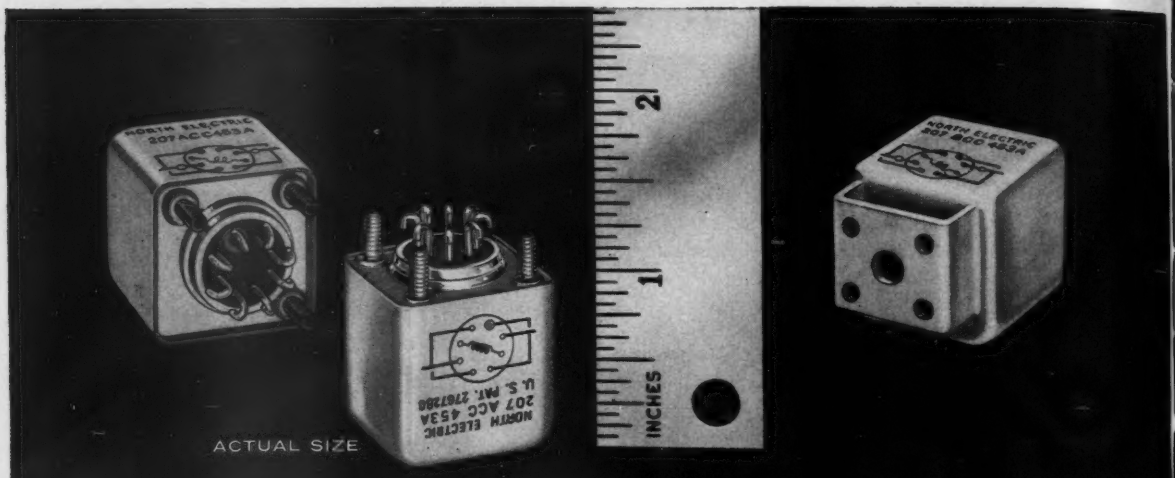
Technician wires Shippingport's control rod position indicators during reactor's construction



Fuel extraction crane controls at Shippingport use oscilloscopes and tv to guide movement



Experimental sodium reactor is producing power in California. Here technicians load core



ARE YOUR "MINIATURE" RELAYS GETTING "ALL SHOOK UP"?

If you have been frustrated in trying to successfully apply a subminiature relay to applications requiring high vibration and shock resistance, don't reach for the tranquillizers – check the North IR-207 type relay.

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Weight:
2 ounces maximum
Enclosure:
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Materials:
Palladium standard, available with gold contacts for low level switching
Rating:
2 amps — 30 volts D.C. resistive
Overload (100 op. maximum):
8 amps — 30 volts D.C. resistive
Resistance:
50 milliohms maximum at rated load
Life:
100,000 operations at rated load

DIELECTRIC STRENGTH
500 volts for 1 minute between all mutually insulated parts
1000 volts for 1 minute between all mutually insulated parts on special order

INSULATION RESISTANCE
100 megohms minimum between all mutually insulated parts

CORROSION RESISTANCE
100-hour salt spray without damage

SHOCK TEST
50 Gs — 11 mil-seconds in all planes

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500 cps. at 10 Gs in all planes
2,000 cps. at 10 Gs in all planes available on special order

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ENGINEERING REPORT

Real Thinking Machines On The Way

ELECTRONIC CONTROLS may one day command machines which learn by doing. A research group at MIT hopes to combine theories of behavioral psychology with principles of digital programming to create machines that will learn by reward and punishment. Mathematicians and digital programmers involved in the research declare that a major breakthrough in components is essential to realization of the dream. At present such a machine would require a prohibitive number of expensive components, but the principles have been established and are waiting to be tried.

● **Some sort of proximity-warning** or control-take over device is definitely a future accessory for American automobiles. A radar unit which is impervious to false alarms such as roadside obstructions falling into the beam's path when rounding curves, has been demonstrated to several major auto manufacturers and favorably received. Another type is restricted to an induction field at 50 to 100 kc, with an effective range of about 100 ft or six car lengths. Ferrite-core loops constitute the antenna system.

● **Transistor manufacturers** are being urged to make modular units which may include matched transistors, basic circuitry, temperature compensators or heat sinks. It is claimed that much greater output and efficiency would be possible, with transistors delivering perhaps as much as 50 watts.

● **Film resistor techniques** are now being adapted to potentiometers, for which the developers claim near-infinite resolution. Contact resistance is reputed to remain constant throughout the range, and test units have withstood forces of as much as 20 g at vibration frequencies without change in setting. At least two makers are working on such devices.

● **Proposal** of Sen. McClellan (D.-Ark.) and Humphrey (D.-Minn.) for establishment of Department of Science and Technology (see p. 8) was anticipated and opposed by Alan T. Waterman, Director of the National Science Foundation in his annual report for the fiscal year ended June 30, 1957. Waterman argues most government departments and agencies have considerable experience and specialized knowledge of the relation of science and technology to their specific activities. Contention: neither logical nor feasible to establish a new department with overall supervision in these areas. It would only be an administrative department superimposed on existing ones, with resulting confusion, frustration.

● **Obsolescence in the missile field** continues at breakneck pace. One missile which is presently vaunted for its low initial and operating costs is already slated for extinction by the presence on the drawing boards of its successor. The guidance system of the new bird will be infrared. Meanwhile there is some indication that addition of radio command to inertial systems may have been flash in the pan. Developers of Thor are gleeful over the success of its inertial-only system. (ELECTRONICS, Jan. 31, p. 16).

TECHNICAL DIGEST

• **Accidental ignition** of guided missile firing circuits during prelaunch checkout is prevented by using selenium photocell in place of battery for powering ohmmeter. Maximum output of cell cannot exceed 0.7 v or 10 ma under any condition of light saturation or failure, in photoelectric safety ohmmeter designed by Fairey Aviation Co. in England.

• **Self-rejuvenating** impregnated cathode by Philips, using molten barium aluminate in porous tungsten body, offers production advantages over older L-type dispenser cathode. As monatomic surface layer of barium is evaporated during surface emission, it is replaced from within. Tungsten porosity of 17 percent gives required rate of barium dispensation.

• **Popcorn** gets complete derating as cushioning material for packaging electronic equipment, in Forest Products Lab report for WADC. Tests showed popcorn to be relatively stiff, with little ability to recover after compression and too much shrinkage with humidity.

• **Positive ion** density measurement in air at earth's surface permits detection of high-altitude clouds of radioactive material. Measurements in San Francisco after Nevada nuclear tests showed that both high and low mobility ions increased to several times normal level. Smog increases only low-mobility ions, and fog cuts down high-mobility ions.

• **Action** before one tv color camera is shown against a background picture or slide viewed by another camera, through use of electronic switching circuit developed at NBC-TV in Hollywood. Action is staged before blue background, with no blue being worn by actors; switchover occurs whenever action camera sees blue. This Chroma Key technique permits studio staging of magic-carpet ride.

Whiskers Provide Low-Temp Data

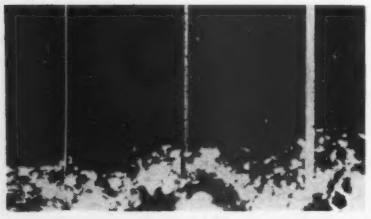
Study of tin whiskers at superconducting temperatures indicates basic differences in behavior from larger size wires

CRYOGENIC switching devices for computers and other applications may get a boost from research now going on at the National Bureau of Standards. Metal whiskers, usually considered a problem in electronic gear, may shed new light on the field of superconductivity.

The Bureau is gathering quantitative data on the behavior of microscopic tin filaments at extremely low temperatures and in the presence of magnetic fields. The work is aimed at understanding the mechanism by which a magnetic field restores normal resistance to the whiskers even though they are held at a superconducting temperature.

An interesting result of the experiments is that the microscopic tin filaments behave quite differently from larger wires. Size is therefore seen as an important consideration in superconductivity.

Restoration of resistance at various temperatures was studied by applying a magnetic field parallel to the axis of the sample. The resistance of the filament was monitored by a Mueller bridge. Specimen current was kept at about 5 microamperes.



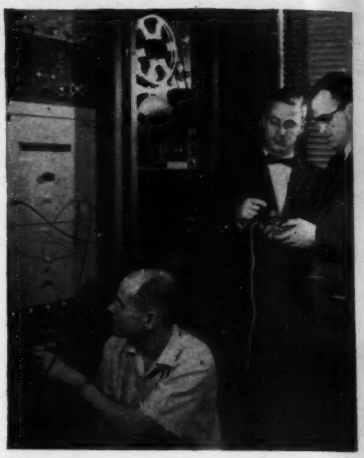
Tin whiskers ranging from one to four microns aid in superconductivity tests

The temperatures at which transitions occur in whiskers when no magnetic field is present were determined. They were found to be close to the accepted value of 3.730 K for bulk natural tin. However, the whisker transitions were found to occur over a fairly wide temperature range.

Magnetically induced transitions, which occur at temperatures well below the transition temperature, were radically different, however. Transitions become sharp and discontinuous. They also exhibit a hysteresis effect. Transitions when going from the superconducting to the resisting state do not occur at the same temperatures as when going in the opposite direction.

The hysterisis disappears at temperatures sufficiently close to the zero-field temperature. In this region, the threshold curve is unambiguously determined and lies well above the curve for bulk tin. The ratio of whisker to bulk critical fields increases with temperature. For the thinnest specimen this ratio was about 5 at the highest measured temperature.

The investigators derived the penetration depth of the field at zero K from the data for each whisker. The depth to which the field penetrates was found to depend on the normal electrical conductivity of the filament as estimated from the change in resistance at the transition.



Magnetic tape unit helps Bell researchers

Phone Conversations Are Digitized

Digital techniques allow computers to predict effects of transmission systems

NEW DIGITAL techniques, used by Bell Telephone Laboratories, will short-cut testing and analysis of voice transmission systems.

Bell researchers developed a system for translating voice signals into pulse-code modulated data, then using the pcm as one parameter in a mathematical model of the proposed circuit. New gear required by the system is a recording-playback unit built by Modac division of Airborne Instruments Lab.

The Modac equipment combines with a commercially available Epsco converter to translate recorded speech signals into digital form. Signals are sampled 10,000 times a second. Each sample becomes a 10-bit pcm digit, then is converted into two 6-bit characters.

This digital information is processed by an IBM 704. The computer is programmed to evaluate a mathematical model of the circuit through which the signal is supposed to pass. Processed data represents the speech patterns that would arrive at the end of the transmission system.

The process is then reversed. The digits are retranslated into PCM code, then into voice signals.

Biggest saving, according to Bell Labs' H. S. MacDonald, comes from keeping "the momentum of our researches. Our experiments keep up with our ideas." The men at the Labs, he adds, avoid the time and expense of elaborate mockups and sample systems, and can put their ideas immediately to the test.

Ultrasonic Unit Photographs Arm

AN ULTRASONIC recorder developed to test fuel elements for atomic reactors recently was used at Argonne National Laboratory for "photographing" the bones of a human arm without x-rays.

The technique has been developed by W. N. Beck of Argonne's Metallurgy division. The unit is a scanner designed to handle volume testing of reactor fuel elements, but Beck thinks the method may have other applications.

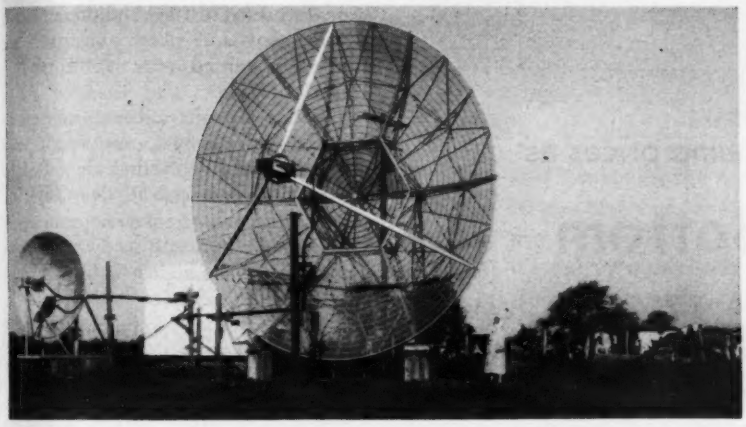
He explains it this way: "In the

scanner ultrasonic waves are used to trace cavities in reactor fuel elements. Waves are absorbed by inclusions within the fuel element, composed of an alloy of uranium and some other metal, and by faults between the fuel element and its protective metal cladding.

"To be tested, a fuel element is suspended in a tank of water; then an assembly consisting of two crystals, one to transmit and one to receive ultrasonic waves, traces across it repeatedly in very narrow lines in a saw-tooth pattern. When a flaw in the fuel element occurs, the waves are absorbed. A white space appears on a sheet of electrosensitive paper that is attached to the recorder."

Beck substituted his own arm for the fuel element, then changed the sensitivity of the recording unit so that it was possible to discriminate between flesh and bone on the electrosensitive paper.

Meanwhile, Back at the Ranch



Over-the-horizon microwave transmission is being tested by Bell Labs from the Newton farm in Pharsalia, N. Y. Signals are received 171 air miles away. Electrically charged fence protects dairy herd

Automatic Radio Repeater Station

RADIO-REPEATING station is operating on wind-swept solitary Valentine's peak in Tasmania, Australia. It is used by the Burnie Board & Timber Co. Pty. Ltd. to control its forest and logging operations and to guard against fires.

The station links a fleet of vehicles equipped with f-m radio telephones maintaining contact up to 160 miles from each other. The station is designed to operate unattended for long periods.

Wind-driven generators feed dual power supplies. Automatic changeover is provided in the event of failure of the main supply.

A mechanical time clock automatically switches the equipment on during the daylight hours only. An override facility is incorporated, however, and a radio tone signal from the central station can keep the repeating station operating continuously during emergencies.

MEETINGS AHEAD

FEBRUARY

S	M	T	W	T	F	S
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2	3	4	5	6	●	8
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MARCH

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APRIL

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13	14	15	16	●	18	19
20	21	22	23	24	25	26
27	28	29	30			

Feb. 7-8: American Society for Quality Control, "Management By Exception", Administrative Application Division, ASQC, Second Annual Conf., Hotel Carter, Cleveland, Ohio.

Feb. 18: Fourteenth Annual Quality Control Clinic, Rochester Society for Quality Control, War Memorial, Rochester, N. Y.

Feb. 20-21: Conf. on Transistor and Solid State Circuits, PGCT, AIEE, Univ. of Penn., Phila., Pa.

Mar. 17-21: Nuclear Eng. & Science Congress, PGNS, EJC, ANS, International Amphitheater, Chicago, Ill.

Mar. 24-27: IRE National Convention All Prof. Groups. Waldorf-Astoria Hotel and N. Y. Coliseum, N. Y. C.

Mar. 24-27: Fourth International Instrument Show, Caxton Hall, Westminster, London, S. W. I.

Apr. 8-10: Symposium on Electronic Waveguides, Microwave Research Institute of Polytechnic Inst. of Brooklyn, N. Y.

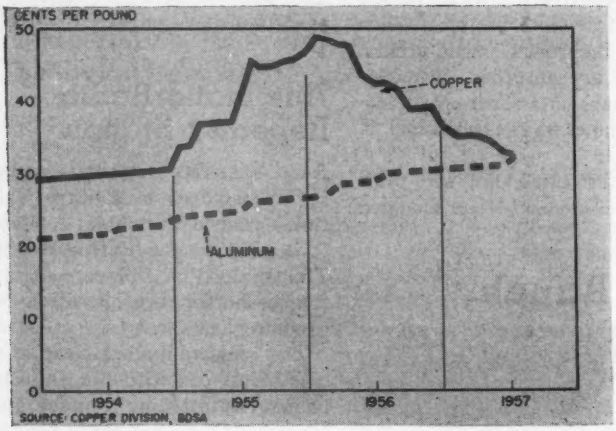
Apr. 10-12: Tenth Southwestern IRE Conference and Electronics Show, St. Anthony Hotel and Municipal Auditorium, San Antonio, Texas.

Apr. 17-18: Second Annual Technical Meeting, Institute of Environmental Engineers, Hotel New Yorker, N. Y. C.

Apr. 21-25: Society of Motion Picture and Television Engineers, 83rd Annual Convention, Ambassador Hotel, Los Angeles.

Apr. 22-24: 1958 Electronic Components Conf. Theme: "Reliable Application of Component Parts," Ambassador Hotel, Los Angeles.

Apr. 24-26: National Academy of Sciences, U. S. National Comm., International Scientific Radio Union, Spring Meeting, National Bureau of Standards, Washington, D. C.



Two electrical metals bump prices as . . .

Copper Hits Bottom

Metal plummets from 46 to 25 cents a pound in 18 months. Some favor lifting tariff. Others don't, feeling prices will rise naturally

COPPER PRICES are just about at rock bottom after an 18-month plunge from 46 to 25 cents a pound. Primary producers have been sharply cutting production here and abroad, but supply continues to exceed demand.

Absolute bottom is 24 cents a pound. When that price is reached, a two-cent protective tariff is automatically imposed. An effort is being made in Congress this year to hike the tariff point to 30 cents a pound.

Increased tariffs on brass and other copper products—or a plan that would negate wage differentials in U.S. and foreign plants—is also sought. Imports on copper and brass have risen sharply due to a constant downtrend in European prices.

All copper producers are not sympathetic to higher tariffs. Some feel that prices will rise naturally while consumption perks up. Tariff changes might also harm international trade pacts.

Copper spokesmen look for a rise in buying and prices shortly. They reason that buying, not consumption, fell sharply in 1957. Major users built inventories as a hedge against labor unrest. When copper unions signed three-year contracts in 1956, it was a signal for users to restrict inventory and use up surplus stocks.

Aluminum is considered one reason why copper consumption has risen more solwly than expected. Aluminum has come on like wildfire in many industries which use both metals. But copper has been substantially more expensive than aluminum. Last fall, their price curves crossed.

New Plastic Output Soars

PRODUCTION of high density polyethylene (HDP) should be close to 300 million pounds by the end of 1958. A high-temperature, high-strength brother of polyethylene, HDP should come into wide electronics use.

First use being made of it by our industry is molded parts. It should be a strong contender for wire insulation. However, one manufacturer, W. R. Grace and Co., says its use on wire is still being evaluated.

Three HDP plants have gone on-stream in the U.S. in the past year: Phillips, 75 million pounds a year; Hercules, 30 million pounds a year, both in 1957, and Grace, 50 million pounds a year, in January. Allied, Celanese, Dow, Koppers and Union Carbide will also supply HDP.

Plastics manufacturers are really rushing HDP. The catalysts used were discovered in 1954 and process development and plant construction were carried out in record time.

HDP is virtually a linear polymer and possesses a far more orderly structure than polyethylene. It isn't as suitable as polyethylene for some of the mass commercial markets (in addition to costing 47 cents a pound, 12 cents higher than polyethylene), but here are its talking points:

- Polyethylene softens in boiling water. HDP will withstand temperatures over 250 F. The presumed reason is that HDP builds up orderly chains under low pressure, using catalysts as rallying points. Polyethylene is jammed into line by high pressure, so therefore becomes more sensitive to a change in environment.

- HDP will go down to −150 F without cracking, is stiffer than polyethylene, has good electrical and chemical-resistant properties, makes a clear film.

As film, HDP has four times the moisture-resistance of polyethylene. It is stiff enough for automatic packaging use. Grace illustrated this point with a bag of potato chips, but a lot of electronic components are packaged like potato chips these days.

Like another new plastic, polypropylene, polyethylene is an olefin. Principles involved in HDP and polypropylene production are expected to bring closer the day of custom-made polymers. Montecatini, of Italy, which introduced polypropylene in the United States, now has competition on its hands from Hercules' new 20-million-pound plant.

Company Closes Tv Tube Factory

ANOTHER TELEVISION picture tube plant is closed. Raytheon announced in January the shut-down of its tv picture tube plant in Quincy, Mass. Now cpt production will be confined to special purpose military and industrial types.

Changes in the tv picture tube business, Raytheon explains, make it increasingly difficult to run the operation at an adequate profit. Replacement sales to distributors will continue, but sales to set makers are stopped.

The plant, in operation since 1953, formerly sent a major part of its output to Raytheon's own tv production line. Raytheon stopped making sets in 1956. While sales to other set manufacturers were increasing, "the continuing squeeze on profit margins coupled with highly seasonal demands" led to the closing, says a spokesman.

Average employment at the plant was 350 persons. This was down to 200 in January due to seasonal demands. Raytheon hopes to relocate many of the remaining employes. Work at its receiving tube plant, also in Quincy, is not affected.

Other sources in the industry see the closing as symptomatic of the problems every independent picture tube manufacturer faces. The difficulty of keeping profits at a satisfactory level is only partially related to the slack-off in new set sales.

Set making is narrowing down to a group of larger firms. This means fewer customers and a larger percentage of tube production in captive plants. These don't have to make a profit on tubes as long as the completed set makes money.

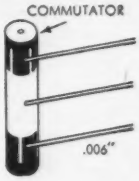
Tube rebuilders have taken some of the replacement tube market. While more sets become eligible for renewal, this portion of the tube market remains level.

EIA statistics for the first 10 months of 1956 and 1957 show what is happening. New tubes for renewal remained at 2.4 million while rebuilt tube sales increased from 2.4 million to 2.6 million. Meanwhile, tubes for new receivers declined from 6.3 million to 5.3 million as set production slipped from 6 million to 5.3 million.

LATEST JAZZ ON THEM DEMAND METERS

New General Electric demand meters present a neat case for the Sigma 42RO relay. Demand meters record average power in a given time interval. With more kilowatt hours being consumed every year, the new GE meters record more impulses per unit time so that the utility can know more accurately (and charge for) peak demand.

GE pulses their new demand meters at the necessary rate using the commutator pictured, and a pair of Sigma 42RO relays in an ingenious relay amplifier circuit. This is the point where the pianist above comes in, in his other role as a laboratory standard. He may look like an ordinary fly to you, but it happens that the force he can exert (after a good night's sleep) on a piano key ⅛" long very nearly equals the maximum torque required to drive the SPST commutator contact device. With a torque limitation like this, the brushes are small and as a result the impulse current has to be kept to a minimum. It is: the 42's need only 5 milliamperes AC to switch the burden of the demand meter.



SIGMA TYPE 42RO RELAY

This virtue of the 42 is commendable in itself. But life tests also show that 100,000,000 impulses (50 million operations) can be transmitted, with an arc-suppressed ½ ampere, 120VAC inductive load. The 42's are DPDT and another 100 million impulses of operation can be obtained by swapping them and using the other set of contacts to carry the D.M. load. In service, this boosts life expectancy to somewhere between 5 and 25 years, depending on the application.

Although flies as precise as GE's are not easy to obtain*, standard Series 42 relays are available on order. Price range $4.60 to $12.80 list. Bulletin sheets giving pertinent 42 data come simply on request.

* Sigma once had one on the payroll, but an avaricious cricket did him in.

SIGMA

SIGMA INSTRUMENTS, INC.
62 Pearl Street, South Braintree 85, Mass.

Agency Unifies Space Work

Advanced Research Projects Agency will run antimissile missile, other "upstream" programs

NEXT TWO STEPS toward actual creation of a unified space agency in the Department of Defense are Senate approval and finding a man to fill the top job.

Defense Secretary McElroy's special assistant, Oliver M. Gale, told ELECTRONICS that Senate approval of forming the new Advanced Research Projects Agency is practically assured now that the House has passed it.

Finding the right man to head the new agency is a bigger problem. Although a number of prospects are being considered, both military and civilian, a selection has not yet been made.

Since ARPA is a Defense agency, ultimate purpose of all its activities will be military. Possibility of forming a civilian, nonmilitary space agency such as proposed by the American Rocket Society (ELECTRONICS, Dec. 20 '57, p 30) and others is therefore, according to Gale, not thrown out.

Funds for space work, however, according to DOD, would probably be easier to come by for the military than for a civilian organization. Total budget requested for ARPA for fiscal 1959 is $340 million. $10 million has been requested as a supplemental for fiscal 1958.

There is no conflict, according to Gale, between ARPA and NACA's recently established space flight committee. It is expected that the two groups will be mutually beneficial.

Projects ARPA will handle are anti-missile missile, military satellites and other "upstream" programs. Lumping anti-missile missile projects together with space craft work has brought criticism from some circles. Probable reason for the combination may be closer to expediency than to any technological affinity the two efforts might have. The need to get anti-missile defense projects out of the do-it-yourself category and into a centralized agency has for some time had high priority in DOD. And ARPA is the first likely vehicle to come along for getting this done.

ARPA will operate much as the three services have in the past with the big exception that one agency will be making decisions instead of three.

If there is duplication of effort within ARPA it will be planned duplication on projects that seem to warrant the extra cost.

ARPA's director—as has each of the three services before—will go wherever he sees fit for research: to industry, universities and the services.

When a project is approaching operational status, he will make recommendations to the Joint Chiefs of Staff for assigning the project to a particular service for operation.

Factor that will determine which service gets what projects will be the nature of the data to be received from the work. USAF will not necessarily be selected to send a rocket to the moon, for example, just because flight is involved in getting there. If the data to be obtained would be of greater benefit to the Navy or Army, that service will be given the job.

NACA's Director, Hugh L. Dryden, however, advocated at New York's IAS meeting last week a "cooperative effort" with DOD, National Science Foundation and the National Academy of Sciences. He stressed that nonmilitary space projects must not be neglected.

MILITARY ELECTRONICS

• **Major Alexander de Seversky** told the Senate Preparedness Subcommittee that work on anti-submarine detection and surveillance was urgently needed. To combat Russia's growing fleet of missile-launching submarines, "a scientific breakthrough is needed to make water transparent," he said.

No military force will be able to survive on the surface of the earth, de Seversky said. The Air Force must be airborne, the Navy go below the surface of the water and the Army stay underground until the air war is won.

• **Progress being made** on Navy's IRBM Polaris is in turn speeding up the nuclear-powered, missile-launching submarine program. At present the U. S. has no ballistic-missile-launching submarine. A supplementary appropriation is now before Congress to provide for three. Budget requests for fiscal 1959, still unannounced, will ask for considerably more.

CONTRACTS AWARDED

Chance Vought gets a $33.5 million Navy contract for quantity production of Regulus II. $26 million is for evaluation and production and the remainder for spare parts and special support equipment. Regulus II will arm nuclear and conventional submarines now under construction. A.C. Spark Plug is working on inertial guidance for the missile.

Designers for Industry gets a $370,000 contract with Army Ordnance

Ballistic Missile Agency to build seven Redstone missile checkout sets, each of which will incorporate lateral and range computer test fixtures as well as two holding fixtures.

Telecomputing Corp. is awarded a $446,484 contract by CAA for an air traffic control beacon interrogator, known as ATCB1-1, and associated equipment.

California Magnetic Control will sell specialized transformers, with power operation of 4,900 cps, and magnetic components for use in "a new version of a missile system", amounting to $100,000.

Gilfillan is awarded $1,597,726 contract with Rome Air Force Depot for 163 modification kits for CPN-4 radar and 75 kits for the RPN-16 set.

Philco will supply AMC with modification kits for the APS-64 radar sets used in the B-52 amounting to $1,329,960.

National Co., Inc. gets $334,250 contract with AMC for airborne cesium beam r-f oscillators as atomic frequency standard.

Western Electric gets $320,000 contract with Army Signal Supply Agency for ten months additional services and materials to continue the study of the entire military communication problem.

RCA will provide BuAer with engineering services to provide technical assistance and instructions in the maintenance, repair and operation of aircraft electrical and electronic equipment under a $1,011,525 contract.

Philco gets a $981,396 contract with BuAer for field engineering services to provide technical assistance and instruction in the maintenance, repair and operation of aircraft electrical and electronic equipment.

New Mexico College of Agriculture and Mechanic Arts also gets an estimated $806,706 contract with White Sands for data reduction services.

Resinite EP-93
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FLEXIBLE AT −90°F!

Cold brittle tests prove Resinite EP-93 flexible at −90°F, yet this Specification Vinyl Insulation Sleeving will withstand 185°F continuous operation, unusual for an L-T tubing.

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New label provides Positive Test No. Identification on every spool

Comes in all 3 Specification size ranges. #20 AWG thru 2½" ID in all standard wall thicknesses.

Cross section of "Soft-Wound" spool

Cross section of ordinary spool

Exclusive Resinite "Soft-Wound" spools deliver sleeving full round

PROPERTY	MIL-I-7444A(1)	EP-93
Brittle Point	−90°F Max.	−90°F Max.
Inflammability	15 Sec. Max.	6 Sec. Avg. 14 Sec. Max.
Corrosion.	Shall not accelerate metal corrosion	Pass
Oil Aging	Shall not deform or lose flexibility	Pass
Fungus Resistance	Shall not support Fungus. No Mercury	Pass
Dry Dielectric Strength	200 Volts/Mil./Min.	390 V/M/Avg. 280 V/M/Min.
Wet Dielectric Strength	200 Volts/Mil./Min.	335 V/M/Avg. 250 V/M/Min.

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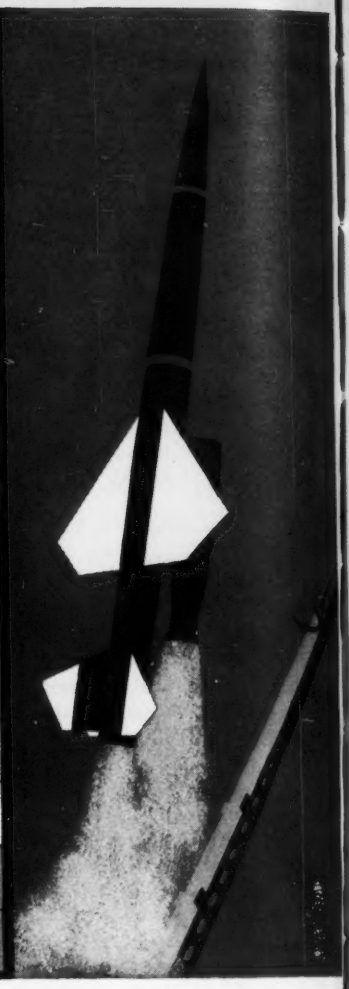

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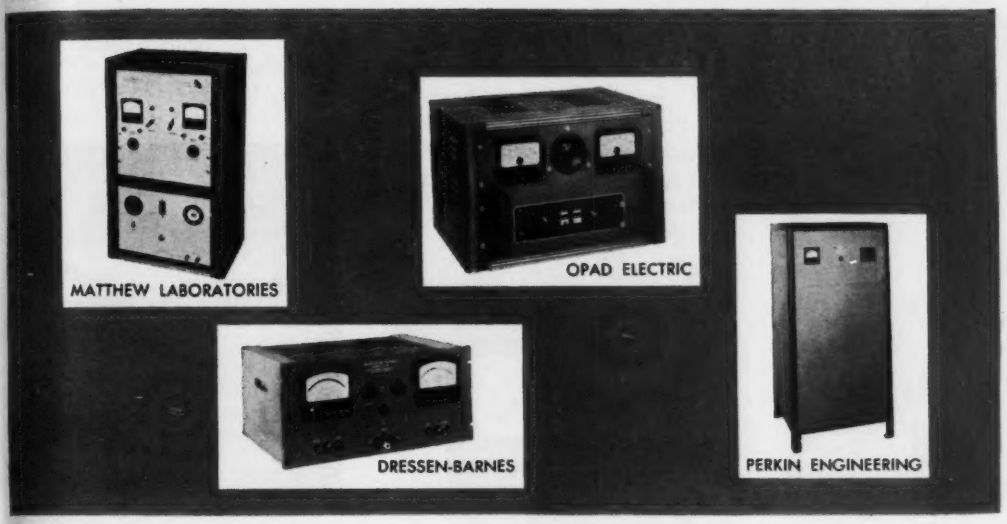


Outputs And Uses Vary

DEMANDS of the latest electronic equipment for highly accurate voltage account for the impressive improvements in new power supplies now being sold. Regulation accuracy is a big factor in these units.

Opad Electric Co., 69 Murray St., New York 7, N. Y., (41), is producing a silicon rectifier power supply providing a stepless controllable output of 0-32 v d-c with a continuous duty full load rating of 40 amperes. Ripple is held to within 0.5 percent throughout the range. Regulation from 1/10 to full load does not exceed 12 percent at 32 v output.

A constant current and constant voltage automatic switchover regulated supply is available from **Matthew Laboratories,** 146 Riverdale Ave., Yonkers, N. Y. (42). Suggested applications are forming of capacitors, controlled and precise electroplating and etching, and other electrolytic processes. Output current range is adjustable from 0-20 amperes and output voltage range, from 0-100 v.

Perkin Engineering Corp., 345 Kansas St., El Segundo, Calif., (43), announces a 25-kw heavy-duty silicon rectifier power supply. It has a d-c output of 125 v nominal at 200 amperes, with a-c input of 208, 230 or 460 v, 60 cps, 3 phase. Voltage regulation is 5 percent maximum no load to full load, and ripple is 5 percent rms. Overload rating is 400 amperes for a duration of one minute and 250 amperes for 30 minutes.

Model 6-IMB d-c power supply for use in transistor circuit development is offered by **Dressen-Barnes Corp.,** 250 North Vinedo Ave., Pasadena, Calif., (44). No derating of output current or of regulation and ripple specifications is necessary from 1 to 60 v. Regulation for 60 v/1,000 ma load is 20 mv change, no load to full load. Ripple and internal noise are below 1.5 mv rms.

Frequency Standards tuning fork type

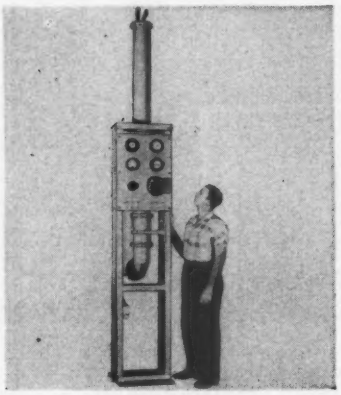
ACCURATE INSTRUMENT CO., INC., 2422 Branard St., Houston 6, Texas, announces a new frequency standard of the tuning fork type. Featuring small size and high accuracy, it will stay within specified tolerance under all combinations of conditions within specifications.

This standard is self contained and requires only 12 v d-c or 30 v d-c to give the output signal. Total current drain at 12 v d-c is approximately 10 ma. Tolerance of ±50

For more information use READER SERVICE CARD

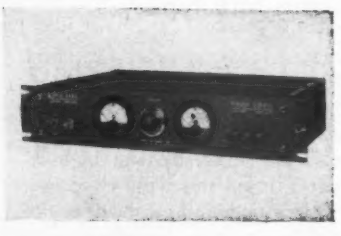
parts per million from absolute frequency is possible. Frequency ranges are from 400 cps to 8 kc.

The unit is priced from $180 to $275 depending upon tolerances required. **Circle 45 on Reader Service Card.**



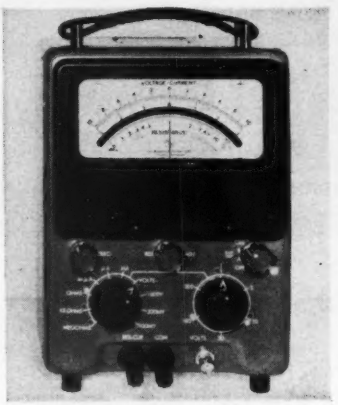
Coax Water Load developed for uhf

CONTINENTAL ELECTRONICS MFG. Co., 4212 S. Buckner Blvd., Dallas 27, Texas. A 6⅛-in. diameter 50-ohm coaxial load, rated at 100 kw maximum continuous power dissipation at uhf has been developed. Vswr is 1.30 or less from 380 to 570 mc and 1.20 or better in the 390 to 525 mc range. This load (model 518-A Mega-Sorber) can be supplied to cover other uhf ranges or a particular uhf with optimum vswr. It is designed to handle peak power of two megawatts. This compact and lightweight load presents only 5 lb pressure drop to the water system at 60 gpm. **Circle 46 on Reader Service Card.**



V-R Power Supply transistorized

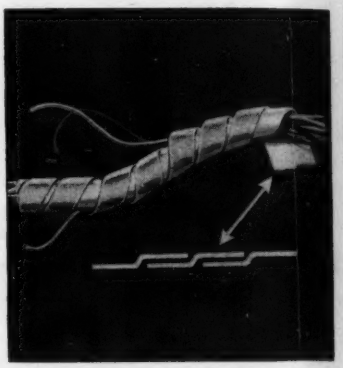
KEPCO LABORATORIES, INC., 131-38 Sanford Ave., Flushing 55, N. Y., has released a new tubeless transistorized voltage regulated power supply. Model SC-32-0.5 delivers 0-32 v, 0-0.5 amperes. Regulation for line or load is less than 0.03 percent or 0.003 v, whichever is greater. Ripple is less than 3 mv rms. Recovery time is less than 50 μsec. Stability for eight hours is less than 0.03 percent or 0.003 v, whichever is greater. Output impedance is less than 0.02 ohm. **Circle 47 on Reader Service Card.**



E-I-R Meter is battery powered

THE BELLEVILLE-HEXEM CORP., 638 University Ave., Los Gatos, Calif. Model 110 E-I-R meter is a battery powered unit for the measurement of voltage, current and resistance. A center zero meter provides plus and minus readings of voltage and current with 9 voltage ranges, 100 mv to 1,000 v full scale, and 18 current ranges, 1 millimicroampere to 300 ma full scale. Accuracy of indication is better than ±3 percent of full scale. Input resistance for voltage measurements is 111 megohms; an 11 megohm isolation resistor is in the pencil probe provided. Voltage drop in current measurements is 100 mv. Because of battery power, the instrument is particularly adapted for current measurements in h-v circuits and the 1-3-10 series of current scales provides good scale overlap without undue accuracy deterioration. Zero drift is less than 1 mv per hr after a 5-min. stabilization period.

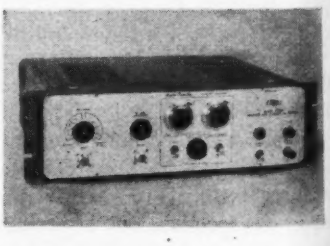
Six direct reading resistance scales provide center readings of 10 ohms to 100 megohms. Graduations are to 0.02 and 100 times center scale reading. Accuracy of resistance indication at center scale is better than ±5 percent. Battery life is approximately 800 hours. **Circle 48 on Reader Service Card.**



Teflon Spiral Cover for high heat uses

ILLUMITRONIC ENGINEERING, 680 E. Taylor, Sunnyvale, Calif., announces a new type of wire harnessing product known as Spiral Cover. It overlaps itself 100 percent forming a double cover over the wire, leaving no open points. Therefore, the insulating qualities are almost equal to solid jacketing

Made only in noninflammable Teflon to meet the growing demand for wire harnessing for high heat applications (200 C) Spiral Cover has an 0.040 in. wall and is available in six different diameters from ¼ in. to 1½ in., and comes in various lengths. **Circle 49 on Reader Service Card.**



Calibrator shows voltage, current

ELECTRO-PULSE, INC., 11861 Teale St., Culver City, Calif. Model

6020B voltage and current calibrator is a unique instrument for the precise measurement of pulse amplitudes. While designed primarily for use in conjunction with magnetic core testing and grading, the unit is also applicable to general pulse, d-c, and sine wave measurement.

Two variable calibrated reference voltages and the signal to be measured are sampled and furnished to an oscilloscope for a superimposed display.

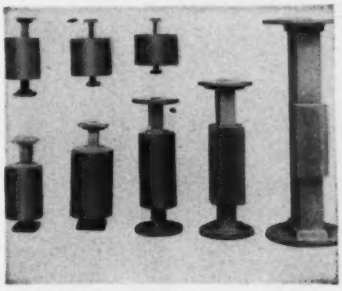
Ten ranges cover 0 to 500 v and 0 to 1,000 ma. Effective zero suppression is provided on the output to allow use of a high gain oscilloscope for accurate comparison. **Circle 50 on Reader Service Card.**

Pulse Generator small, lightweight

Arnold Magnetics Corp., 4613 W. Jefferson Blvd., Los Angeles 16, Calif. A new power supply converts low-voltage d-c to high voltage d-c or a-c pulses. The unit is designed to deliver pulses having peak power of 150 w. It is used to pulse missile tracking equipment, radar equipment, and airborne flasher beacons.

Operating from a 28 v d-c line, the unit delivers a peak pulse power of 150 w at a 20 percent duty cycle. Peak output voltage can be any value between 20 and 2,000 v, with a rate of from 500 to 3,000 pps. Rise and fall times are each approximately 100 μsec. Pulses are generated in a saturable reactor operating in conjunction with power transistors. Amplitude and frequency of pulses are held within 2 percent for variations in line input voltages from 24 to 30 v, and for load variations from half load to full load.

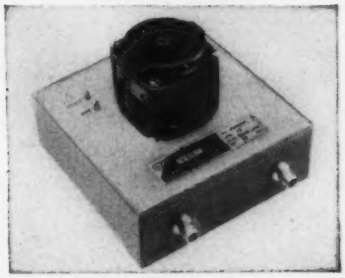
Designated as model 591-P, the generator measures 3 in. o-d by 3⅞ in. high. Weight is 19 oz. **Circle 51 on Reader Service Card.**



Ferrite Isolators for test equipment

Airtron, Inc., 1096 W. Elizabeth Ave., Linden, N. J. Designed to meet the high characteristics required for test equipment applications, the new series of extremely broad frequency band ferrite isolators are available in WR-28, WR-42, WR-62, WR-90, WR-112, WR-137, WR-187, WR-284 waveguide sizes.

Most beneficial for use as test equipment, these ferrite isolators provide optimum frequency stability of test equipment and measurements during test, and extend the life of the r-f source by giving a high degree of isolation between the r-f source and the microwave components under test. **Circle 52 on Reader Service Card.**

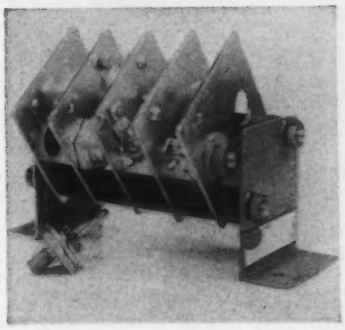


Delay Line operates at 125 C

Control Electronics Co., Inc., 1925 New York Ave., Huntington Station, N. Y., has developed a new variable delay line for operation at the very high frequency of 125 mc. Model V-215 has a total delay of 50 millimicroseconds and an impedance of 50 ohms.

Designed for a continuous motor driven application, it is constructed with a rugged printed circuit commutator type switch having rhodium plated segments and a silver alloy wiper arm. Resolution is one part in 120.

The new delay line is also supplied as a manually operated unit and in other delays and impedances. **Circle 53 on Reader Service Card.**



Rectifier Stacks high power devices

General Instrument Corp., Automatic Mfg. Division, 65 Gouverneur St., Newark 4, N. J. Designed to meet high power rectification applications for which a limited amount of space is available, stacked assemblies of silicon rectifiers are being produced. Pictured is a single phase full wave bridge assembly, rated at 25 amperes average rectified current at an rms input of 245 v with forced air cooling, utilizing 2 in. by 2 in. fins. Overall dimensions of this assembly are 5 in. by 3 in. by 2 in.

Developed for use in all types of military and commercial equipment where the basic limitations of other types of rectifiers must be overcome, these units are designed for high reliability under the most severe environmental conditions of moisture and vibration fatigue, high acceleration vibration, centrifuging, shock and temperature cycling. They have been successfully oper-

Is it possible to build a **MAN?**

"Theoretically, yes," said the scientist. "Or a reasonably remarkable imitation—a kind of mechanical analogue. Call it a habit machine, a mechanism operating according to the laws of the conditioned reflex."

You mean that you could actually build a mechanical mind? One that would exhibit emotions —such as love, fear, anger, loyalty?

"We're doing something like that now in advanced missile development," the scientist replied. "In a limited, highly specialized way, of course."

"Take the 'pilot' that is being developed for the big long-range missile. *He* has a wonderful memory, and can solve many complex navigational problems in a flash. *He* loves perfection, and actually becomes highly excited when *he* gets off course. *He's* a tough-skinned character, impervious to the cold at several hundred miles altitude and the incredible heat at re-entry. And *his* loyalty is heroic. *His* life is a single mission, the mission *his* whole life... and maybe ours, too. *He's* a pretty important *fellow."*

What about the complete man-made Man? What would that entail?

"A mechanism the size of the capitol in Washington, and the best scientific resources in the world. But it could be done. You see, it's only a question of how physical matter is organized. As a great biophysicist explained, 'If material is organized in a certain way, it will walk like a man. If it is organized in another way, it will fly like a missile.'"

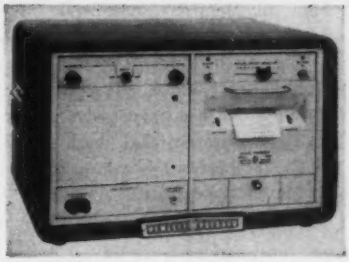
Still, wouldn't there be something missing in the complete man-made Man—something very important?

"Yes," said the scientist. "A soul."

MARTIN

BALTIMORE·DENVER·ORLANDO

ated at ambient temperatures ranging from −50 C to +165 C, and they can be stored at temperatures ranging from −65 C to +180 C. **Circle 54 on Reader Service Card.**



Digital Recorder 11 column entry

HEWLETT-PACKARD CO., 275 Page Mill Road, Palo Alto, Calif. Model 560 A digital recorder prints 11 column digital information at rates to 5 prints per sec. Although primarily designed to make a permanent record of electronic counter read-outs, it can be used with two or more counters simultaneously, digital voltmeters, time recorders, flowmetering equipment and systems, such as telemetering installations and engine test stands.

In addition to the printed tape record, model 560 A provides an analog current or voltage output to drive a galvanometer or potentiometer strip chart recorder or to provide a servo control.

The unit is priced at $1,390 but may be bought for 6 column operation for $1,265, adding the other columns later. The print mechanism is available separately for $600. **Circle 55 on Reader Service Card.**

Low-Mu Triode for wide-angle tv receivers

SYLVANIA ELECTRIC PRODUCTS, INC., 1740 Broadway, New York 19, N. Y. A new octal-based, T-9 high perveance, low-mu triode designed for use as a vertical deflection amplifier tube in wide angle tv receivers, has been announced.

Designated type 6CK4, the tube features a maximum plate dissipation of 12.0 w and an average cathode current of 100 ma. With

a maximum peak positive-pulse plate voltage of 2,000 v (absolute) and a maximum peak cathode current of 350 ma, the 6CK4 is practical for both black-and-white and color tv applications.

Intended for tv receivers with high accelerating potentials, the new tube incorporates a plate capable of conservative operation at rated dissipation. At the same time, the base pin has been isolated electrically to withstand high pulse plate voltages. **Circle 56 on Reader Service Card.**

Test Oscillator pushbutton design

ALECTRA DIVISION, Consolidated Electrodynamics Corp., 325 North Altadena Drive, Pasadena, Calif. Specifically designed for repetitive test and maintenance operations in the telecommunications industry, a new test oscillator features eight push-button-selectable frequencies and all-transistor circuitry.

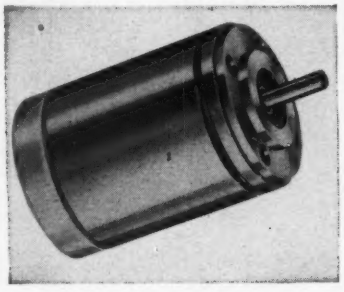
Providing a balanced-output impedance of 600 ohms, model 25 A is completely portable, has a self contained power supply, and weighs only 6-½ lb including batteries. The instrument is particularly useful where output-level stability and freedom from disturbances caused by power-line fluctuations are important. Warmup is eliminated as inherent characteristics of transistors permit instant, drift-free operation.

The stable frequency and output level make it ideal for use on telephone, telegraph, and other information-handling equipment. It provides a fixed-output level of zero dbm, as well as an adjustable level up to 2 v. The instrument is furnished with eight factory-preset frequencies within any 10-octave range between 100 cps and 150 kc. **Circle 57 on Reader Service Card.**

Image Orthicon for color tv cameras

RADIO CORP., OF AMERICA, Harrison, N. J. Type 7037 image orthicon makes possible reductions in the cost of studio lighting, air conditioning and camera operation. The photocathode used in the tube is an improved type featuring relatively wide spectral response with high blue sensitivity, high green sensitivity, and good red sensitivity. This spectral characteristic enables the tube to translate colors very accurately when operated in a color camera with appropriate color filters and optical arrangements.

Other features include a stabilized target, micro-mesh screen, and super-dynode design. **Circle 58 on Reader Service Card.**



Servo Motor high torque-to-inertia

HELIPOT CORP., Newport Beach, Calif., announces the addition of the model 11SM 460 to its growing line of rotating components. The size 11, 115-v 400-cycle, high torque-to-inertia servomoter is rated for 200 C unit temperature, continuous duty operation at stall.

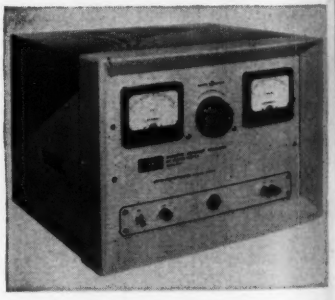
Power requirements at stall are 4.0 w per phase. Custom windings permitting the use of transistorized amplifiers, and various impedances, are available on request. Fixed-windings can be wound for operation from any standard carrier voltage supply. All windings are completely encapsulated.

Precision manufacturing techniques insure the environmental integrity of the servomounting unit, which is 1.632 in. long by 1 in. in diameter and weighs 4 oz. The stainless steel housing and shaft are both passivated. Stainless steel ball bearings are custom fitted to the shaft and housing—shaft runout is held to 0.001 in. TIR.

Stator and rotor are high-temperature assemblies using corrosion resistant laminations . . . rotor is precision aligned for minimum slot effect. **Circle 59 on Reader Service Card.**

High-Speed Counters uni-and bi-directional

DIGITAC, INC., 420 South Beverly Drive, Beverly Hills, Calif. Counting rates to 40 per sec and a life span exceeding 10,000,000 counts are available in a new line of electromechanical counters and countertransmitters. The line includes both uni-and bi-directional units, the later accepting both add and subtract impulses; functioning as efficient summation counters. Heart of all units is a dynamically balanced incremental actuator with unique qualities. Applications include airborne and ground instrumentation, (telemetering), production quality and inventory control, automation, computing and business machines, aircraft and missile readout. **Circle 60 on Reader Service Card.**



D-C Power Supply completely tubeless

PERKIN ENGINEERING CORP., 345 Kansas St., El Segundo, Calif., has announced its newly designed 0-32 v at 25 amperes power supply. This unit is completely tubeless, con-

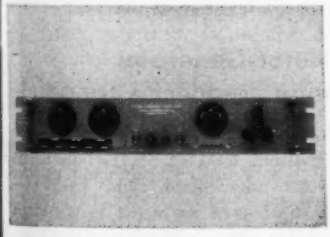
tains no moving parts, and has a wide voltage range. The regulation accuracy is ± 1 percent at 28 v and ripple is 1 percent rms. The unit weighs approximately 110 lb and is furnished in a cabinet measuring 20¼ in. wide by 16⅝ in. deep by 13¾ in. high.

This power supply, which represents a very economical solution to d-c power needs, is ideally suited for laboratory, production, and incoming inspection testing applications. Designated model M60V, it is offered for delivery immediately from stock. **Circle 61 on Reader Service Card.**

Ferrite Material for tv industry

FERROXCUBE CORP. OF AMERICA, 50 East Bridge St., Saugerties, N. Y., has developed a new ferrite material designated as Ferroxcube 3C2. It has a nominal initial permeability of 1,250 compared to 900 for the previously standard Ferroxcube 3C cores. Ferroxcube 3C2 assures peak performance of television flyback transformers at no increase in cost.

The new ferrite material is immediately available and is currently being supplied in the popular core shapes. **Circle 62 on Reader Service Card.**



Power Oscillators single or multi-channel

CARDINAL INSTRUMENTATION CORP., 4201 Redwood Ave., Los Angeles 66, Calif. Fixed frequency power oscillators provide 6w of very stable, harmonic-free a-c power. Single or multiple channel units range in frequency from 200 to 15,000 cps and from 10 to 150 v rms output into a 6w load. Output frequency and voltage stability and

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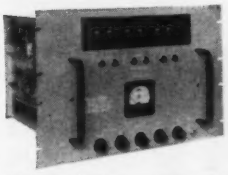
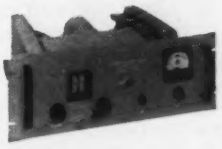
Crystal Filters in the 10 Kc to 30 Mc range

High Power Telemetering Diplexers for severe environment



Digital Timing Generator and Magnetic Tape Search Unit for rapid access in analog data reduction systems.



Ultra Stable Oscillator. One megacycle signal source. Stability: 1 part in 10^9 per day. Multipliers and Dividers for other frequencies.

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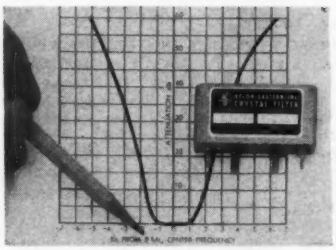
distortion are better than 0.08 percent of rated output from no load to full load. Rated output voltage and frequency are adjustable with panel mounted trimmers and the output voltage can be varied from 0 to rated value with a precision dual attenuator. Four terminal output provides complete flexibility for operation into any type of balanced or unbalanced load, either floating or grounded. Units designed for 19 in. panel mounting in a minimum of height are available for fast delivery. These units are ideally suited for powering gyros, computers, strain gages and other types of a-c transducers and for use in laboratory and production testing of precision a-c components of all types. **Circle 63 on Reader Service Card.**



Crystal Filters miniature devices

HYCON EASTERN, INC., 75 Cambridge Parkway, Cambridge 42, Mass., has developed a miniaturized symmetrical bandpass crystal filter specially designed for single conversion receivers used in mobile services. Designated the model 9 MA, it measures $1\frac{31}{32}$ in. long by $\frac{13}{32}$ in. wide by $\frac{15}{16}$ in. high.

Center frequency is 9 mc; passband ripple, less than $\pm\frac{1}{2}$ db; bandwidth at 6 db attenuation, 3 kc; bandwidth at 60 db attenuation, 12 kc; insertion loss, less than 3 db, impedance, 1 K nominal.

A wide impedance range may be accommodated by the use of simple resonant circuits. Model 9 MA may be employed at a high impedance level to obtain maximum gain with vacuum tube circuitry, or at a lower impedance level to obtain maximum power transfer with transistor circuitry. **Circle 64 on Reader Service Card.**

Digital Clock priced at $495

WANG LABORATORIES, INC., 37 Hurley St., Cambridge, Mass., has developed a new digital clock. It covers a full 24 hours and has digital outputs in mechanical contacts down to minutes. The device is constructed with precision gears, timing motor and coding disks.

The clock also comes with in-line visual readout of $\frac{5}{8}$ in. numerals. The contact can be used to readout directly to a printer or any other output device and its size is 5 in. by $7\frac{1}{2}$ in. by $5\frac{1}{2}$ in. **Circle 65 on Reader Service Card.**

Motor-Generator wide frequency range

JOHN OSTER MFG. CO., Avionic Division, 1 Main St., Racine Wis. Newly developed type 15-MTG-6276-02 is a 28 v d-c p-m motor driving a tach generator. The tach generator has a wide frequency range from 380 to 1,760 cps at 115 v a-c input, output of 1.65 v minimum at 11,000 rpm minimum with 25,000 ohm load, linearity 1 per cent minimum up to 5,000 rpm, and phase shift output within 15 deg of input at 400 and 1,600 cycles. Motor input is 28 v d-c, rated torque 0.3 oz in. and brush life 1,000 hours. It meets MIL-E-5272. **Circle 66 on Reader Service Card.**

New Literature of the Week

MATERIALS

Glass-Supported Teflon. Continental-Diamond Fibre Corp., a subsidiary of the Budd Co., Newark 107, Del. Bulletin GST-58 is an 8-page brochure giving mechanical, electrical and chemical properties of glass-supported Teflon sheets, tapes, laminates, metal-clads and fabricated parts. **Circle 67 on Reader Service Card.**

COMPONENTS

Components Catalog. Anderson Controls, Inc., 2777 Mannheim Road, Des Plaines, Ill. A new catalog includes illustrations, technical data, charts and graphs on solenoids, coils and electronic components. **Circle 68 on Reader Service Card.**

Electronic Components. Universal Relay Corp., 42 White St., New York 13, N. Y., has issued a 32-page catalog showing relays, steppers, solenoids, rectifiers and other electronic components. **Circle 69 on Reader Service Card.**

Pigtail Splice. Burndy Corp., Norwalk, Conn. A new data sheet describes the BURCAP, a compression-installed, insulated fixture-type splicing connector. Complete test and dimensional data are listed. **Circle 70 on Reader Service Card.**

Precision Variable Resistors. Chicago Telephone Supply Corp., Elkhart, Ind. Four-page data sheet No. 170 covers the new precision wire fixed resistor with the unique "floating element." Included are descriptions, illustrations, and a table of physical and electrical specifications.

EQUIPMENT

Computer Language Translator. Electronic Engineering Co. of Calif., 1601 E. Chestnut St., Santa Ana, Calif. A 4-page folder covers a computer language translator for data processing systems. Operation and construction are discussed. **Circle 71 on Reader Service Card.**

Digital Tape System. Ampex Corp., 934 Charter St., Redwood City, Calif. A 16-page brochure describes a new magnetic-tape input/output system for digital computers and related equipment. **Circle 72 on Reader Service Card.**

Engine Testing System. BJ Electronics, Borg-Warner Corp., 3300 Newport Blvd., Santa Ana, Calif. A bulletin describing the S-100 automatic data handling and recording system for engine test facilities has been released. **Circle 73 on Reader Service Card.**

Microwave Noise Sources. Waveline Inc., Caldwell, N. J., offers a 6-page folder illustrating and describing a line of microwave noise sources featuring modulated output, visual display and direct reading. **Circle 74 on Reader Service Card.**

Shorted Turns Indicator. B & K Mfg. Co., 3726 N. Southport Ave., Chicago 13, Ill., has issued a bulletin on the model 100 shorted turns indicator which speeds coil test, stops losses and cuts costs. **Circle 75 on Reader Service Card.**

FACILITIES

Ceramics Services. Thermo Materials, Inc., 4040 Campbell Ave., Menlo Park, Calif. A six-page bulletin describes the company's facilities and services for R&D, prototype design and production of industrial ceramics and ferrites. **Circle 76 on Reader Service Card.**

Ultrasonic Testing. Sperry Products, Inc., Shelter Rock Road, Danbury, Conn. Profitable applications of ultrasonic inspection methods and equipment to quality control, production testing and preventive maintenance are described in a new booklet. Copies are free on letterhead request.

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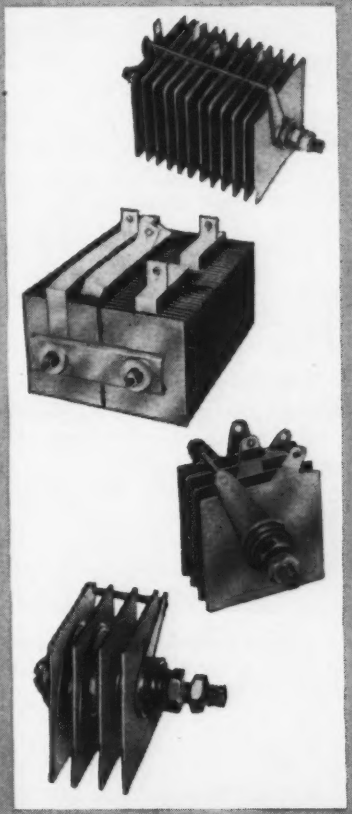
Whatever your rectifier requirement—low voltage and high current, high voltage and low current or any other combination—Chatham's unapproached experience in this highly specialized field is readily yours. Please contact Engineering Department, Chatham Electronics, Livingston, N. J.



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CIRCLE 25 READERS SERVICE CARD

1958: Radio's Biggest Year

FCC's year-end report says 1¼ million transmitters are in use as spectrum competition grows

JUDGING from FCC's recently issued year-end statement, 1958 will be the most active year in radio history. Commission Chairman J. C. Doerfer reports there are now about one and a quarter million fixed and mobile transmitters in use, and applications are on file for many more in 1958.

The phenomenal growth of telecommunications creates a number of situations that will affect the broadcast industry this year.

"Service expansion and technical developments are expected to keep rules and regulations in a constant state of flux," says Doerfer. New developments aimed at getting more use out of the available spectrum will certainly need study, may require a whole set of new rules.

More a-m and tv station applications will be in competition with others, and subject to interference claims, than ever before. In 1957 a third of all applications had to go to hearings. Some cases coming up may take at least a year to go through procedures. To help break the bottleneck, FCC suggests that Congress change the laws to allow station licenses to run for five years instead of three.

Station antennas may be in for a new look as increased heights menace air navigation. This year will see a Commission proposal for establishing "antenna farms" for antennas topping 500 feet. The "farms" will be located away from airlines. About 90 towers over 1,000 feet high are now operating, authorized, or applied for.

Commercial f-m stations now show their first numerical increase in nine years. Of the more than 700 f-m stations in operation, nearly 600 are commercial, and over 150 are educational. For the first time in years, some f-m station applications are in competition. Commission credits the increase largely to added income through background music operations in which nearly 100 f-m stations are engaged.

Safety and special radio services authorizations now exceed 400,000. Competition is keen enough in this area to warrant special revamping studies now being conducted by the commission. These are being watched closely both by broadcasters and industrial spectrum users.

Chief among headaches facing the Commission for 1958 are growing interference and enforcement problems. Other thorny issues center around federal laws prohibiting commissioners from consulting staff experts, and mounting numbers of congressional committee inquiries. It all adds up to increased workloads for a small-sized staff.

FCC ACTIONS

• **Approves** c-p for new tv station for University of New Mexico and Albuquerque board of regents.

• **Reallocates** two 90-kc blocks of spectrum space to International Fixed Public and Aeronautical Services, to be cleared in five years of mobile services.

• **Gives** Commonwealth of Pennsylvania seven licenses for coastal radio services.

• **Grants** authority to New Jersey Bell Telephone and N. Y. Telephone to supplement existing facilities.

• **Amends** class B f-m allocation plan by substituting channel 273 for 299 in Salinas, Cal., 298 for 300 in Chicago, 293 for 294 in St. Louis. No existing stations are affected.

• **Allows** extension to June 13 as filing deadline for comments on amending rules concerning tv station reference test signals.

• **Assigns** WGMS-FM, Washington, D. C., c-p to RKO Teleradio Pictures Inc. as voluntary transaction.

• **Accepts** application from Redwood TV Improvement, Redwood Falls, Minn., for c-p for tv translator to pick up WCCO, Minneapolis on channel 70.

• **Grants** subsidiary communications authorization to WQAL, Philadelphia to furnish background music on multiplex.

STATION MOVES and PLANS

KATV, Pine Bluff, Ark., petitions for allocation of Channel 7 from Pine Bluff to Little Rock, and Channel 9 from Hot Springs to Pine Bluff.

KGW-TV, Portland, Ore., license assignment goes from Pioneer Broadcasting to King Broadcasting.

WJBF, Augusta, Ga., files for c-p to replace expired permit for changes in existing station.

WTUN, U. of Tampa, Fla., asks for renewal of f-m permit.

WGMS-FM, Washington, D. C., gets permission to transfer c-p to RKO Teleradio Pictures, Inc.

KATZ, St. Louis, Mo., increases

daytime power from 1 to 5 kw, gets ok to use old main transmitter as auxiliary on remote control.

KJEO, Fresno, Cal., receives approval for extension of completion date.

KGHL, Billings, Mont., plans to operate transmitter by remote control while using nondirectional antenna.

KOAT-TV, Albuquerque, N. M., gets license for tv station; erp visual 87.1 kw, aural 44.7 kw.

KPAR-TV, Sweetwater, Tex., changes make of transmitter amplifiers, makes other equipment changes.

WAPI, Birmingham, Ala., files for c-p to go from 10 to 50 kw, install new transmitter, and change antenna system.

WMCD, Welch, W. Va., receives word that license renewal application will necessitate a hearing.

KAIR, Tuscon, Ariz., files for modification of license to change licensee name to Joe DuMond Radio Enterprises Inc.

WMPT, South Williamsport, Pa., asks for c-p change to extend completion date.

WRUF-FM, University of Florida, Gainesville, Fla., applies for renewal of license.

KPOK, Scottsdale, Ariz., gets license covering increase in power from 1 kw to 5 kw.

KD-5519, South Bend, Ind., receives c-p for new tv pickup station.

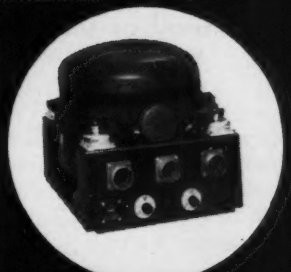
WAMF, Amherst College, Mass., plans to change frequency to 89.5 mc.

WTVC, Chattanooga, Tenn., c-p assignment goes to Martin Theatres of Georgia, Inc.

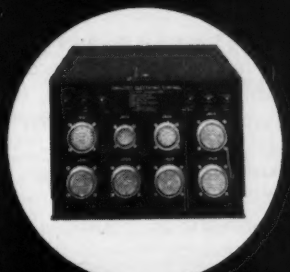
KORC, Mineral Wells, Tex., plans to operate transmitter by remote control.

WAPD, Kane, Pa., receives license to install new transmitter.

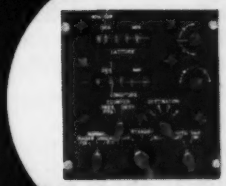
INERTIAL GUIDANCE SYSTEMS IN PRODUCTION



INERTIAL PLATFORM
Lightweight and compact, Kearfott four gimbal inertial platforms are characterized by rapid warm-up and alignment. Suitable for manned aircraft or missile applications.



COMPUTER-AMPLIFIER
For analog or digital data processing. Available with fully transistorized amplifier modules.



PANEL
Display and control panel for pilot reference or ground support equipment.

Other Kearfott systems feature 18 pound, all attitude platforms with 2 minute warm-up time. Examples of compass systems are conventional or roll stabilized directional gyros and all attitude platforms with 0.25°/hour maximum drift rates.

KEARFOTT COMPANY, INC.
LITTLE FALLS, N. J.

Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J. Midwest Office: 23 W. Calendar Ave., La Grange, Illinois. South Central Office: 6211 Denton Drive, Dallas, Texas. West Coast Office: 253 N. Vinedo Avenue, Pasadena, California.

Kearfott

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Boom in Small Craft

Latest New York show indicates pleasure craft are now becoming the mainstay of small boat electronics

SALESMEN AT THE National Boat Show in New York this January were almost unanimous in thinking that pleasure boats are becoming the mainstay of small boat electronics.

Buying by small commercial craft is leveling off. There is a decline in sales to fishermen, an important market. One rep selling high-quality commercial gear said it has been a bad year.

Exhibitors felt that barring a prolonged recession, pleasure boat sales will continue to pick up in coming years, by sheer weight of boat numbers and better electronic product design.

New products last year were aimed at small power boats. Pretuned, easy installation radiotelephones have caught on well throughout the country. The number of firms exhibiting them has grown from two to five.

This year, some companies set course for sailboats and outboards lacking generators. Transistors, with their low power drain, are the market-opener.

Aerosonic Corp. introduced radiotelephones with all-transistor receivers, part-transistor transmitters. They receive a full year on one battery and send at half the normal power drain.

Raytheon showed an all-transistor direction finder which will operate two or three boating seasons on one battery charge. Heath exhibited a transistorized d-f for the do-it-yourselfer.

Trends in motors seemed significant to some representatives. New motors tend to place outboards in the inboard class, therefore qualifying them as better customers for electronics.

Outboards are getting bigger and handling generators. Some of the new outboards are actually inboards housed near the stern so shafts are unnecessary and the propellers may be raised.

There is nothing electronic about motors yet but some firms are edging in with transistorized d-c/a-c power conversion units. Airpax Marine has a tachometer which, instead of the usual vibrator, uses an encapsulated magnetic amplifier to count spark firings.

Electronic Car Control Nears

ELECTRONIC VEHICLE control on U.S. Highway was discussed before key American highway experts in Washington, D. C. a week ago last Wednesday.

The Association of American Roadbuilders attended a presentation by RCA. The group was informed electronic vehicle control could become a reality in the foreseeable future.

The RCA system has a dual backbone: wire loops the size of a car's ground area, and a buried guidance cable in the center of the road. The loops are buried in the roadbed and connected to roadside detector units. The units are activated by induction changes caused by cars passing the loops.

The signals thus generated activate warning lights. They can eventually be combined with simple receivers and other equipment in vehicles to control speed.

The guidance cable radiates a constant signal received by the car's steering equipment to keep the vehicle centered.

The loop system could provide "fore and aft" signals to warn or control vehicles preceding or following. It can also operate roadside warning lights.

Civil Engineers Boost Computers

CIVIL ENGINEERS, currently busy with major roadbuilding and other projects, are becoming excellent customers for electronic computers.

Eleven papers on computer applications were read recently at the annual convention of the American Society of Civil Engineers in New York. (Underground power stations, 12 papers, was top subject.)

Speakers pointed out the use of computers in water system design, sanitary engineering, pipeline network analysis, hydraulics and highway engineering. They save time and quickly explore design variations.

One of the 2,200 engineers present, Don M. Corbett, told an ELECTRONICS editor why he is sold on computers. A former ASCE director, he is Indiana district engineer, U.S. Geological Survey, Surface Water Branch.

Wabash River flow records dating back 40 years, a total of 1,500 water-years from 140 gaging stations, were taped and analyzed by computer, he said. Resulting drought and flood information will help govern the area's industrial development, water legislation, reservoirs and flood control.

The study cost $6,000. Manual calculation would have taken two man-weeks per gaging station. Periodic up-to-date reports are also obtained in the same fashion. The Survey's computer in Washington is used, but Corbett would like to have a small computer in his office.

The ASCE opened its convention to exhibitors for the first time. Of 31 exhibitors, five showed how electronics aid civil engineers.

Aero Service, Fairchild Aerial Surveys and Jack Amman Photogrammetric Engineers use electronic equipment in connection with aerial mapping, oceanography or tellurometer surveys. Edo Corp. and Fairchild have sonar which will graph sediment layers and show rock strata below bodies of water. Engineers also use sonar to position underwater pipelines, foundations, fill, excavations, to locate channel obstructions and for water-

front property surveys.

Bludworth Marine offered an underwater tv system normally used for naval salvage operations, etc.

Airplane Makers To Share Tapes

A COOPERATIVE PROGRAM to provide western aircraft manufacturers with magnetic tapes for machine control is in effect at Convair Division of General Dynamics.

Convair will make tapes for numerically-controlled machine tools for Boeing, Douglas, Lockheed, Rohr and other aircraft firms using tape-controlled machines to fill military contracts.

A $224,000 numerical director unit was installed at Convair in January, under the Air Force tooling program. The director, which transcribes coded machine instructions, is the only one so far on the west coast, according to Convair.

The firm received the director for use with two $235,000 Giddings and Lewis milling machines which will produce parts for F-102A and F-106A supersonic interceptor planes.

Canada Tv Airs Subliminal Show

THE CAT JUMPED OUT of the bag up in Toronto, Canada a few weeks ago. The Canadian Broadcasting Company aired the first network tv program to carry a subliminal message.

The message "Telephone Now" was flashed 352 times during the half-hour Closeup program. (Closeup compares to *See It Now, Wide Wide World.*) Special permission for the trial was granted by the Canadian Board of Transportation, the Dominion's FCC. Viewers were not told what the message said.

As ELECTRONICS goes to press, Canadian reaction is still not all in. CBC's network reaches about 2.5 million viewers. Station officials say it will take weeks to scout out the full story.

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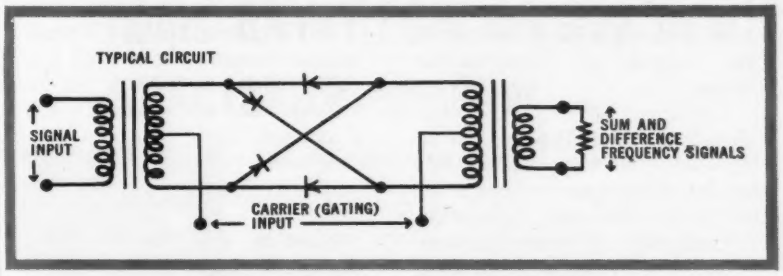
APPLICATION: Used to impress a carrier frequency source upon a signal frequency source to generate signals of sum and difference frequencies while simultaneously suppressing the carrier from the input and the output circuits and also isolating the input and output circuits. See schematic below:
NOTE: By impressing a pulse signal on the carrier input terminals, the input signal is effectively switched (gated) on and off at the output circuit. Polarity of the switching pulse determines phase of the output signal.



SPECIFICATIONS (H.S.T. PART 956-0259-300)

DESIGN SPECIFICATIONS: MIL-T-27A, Class R, Grade 4
SIGNAL SOURCE IMPEDANCE: 1000 ohms
SIGNAL INPUT VOLTAGE: 45 volts P-P maximum
SIGNAL INPUT FREQUENCY: 1300 cps
GATING SOURCE IMPEDANCE: 400 ohms
GATING SOURCE VOLTAGE:
Square Wave + 18 to — 18 volts P-P
GATING SIGNAL FREQUENCY: Square Wave, 650 cps
OUTPUT LEVEL: 0.25 to 2.0 volts P P
BANDWIDTH: 500 cps to 15 kc ± 3 db
CARRIER SUPPRESSION: 50 db minimum
SIZE: 1⅜" x 2⅛" x 2¼6" high
WEIGHT: 0.6 pounds maximum

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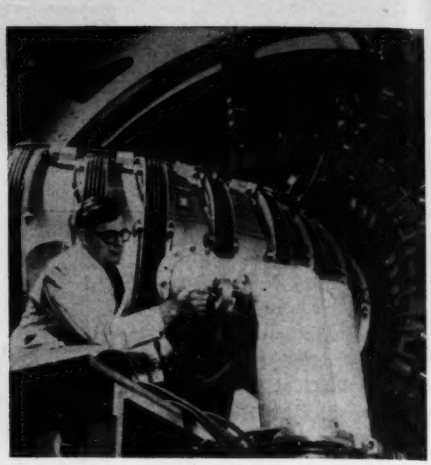


. . . British scientists at Harwell measure gas discharge in ZETA with oscilloscope . . . big ring around torus is vertical transformer. This apparatus produced a . . .

Breakthrough in H-Power

ATOMIC ENERGY horizons were greatly broadened by confirmation January 24 that British scientists have achieved a breakthrough in the control of thermonuclear fusion.

Redoubled efforts, here and abroad, to exploit H-power can be expected. For electronics, this means another spur to nuclear instruments and research apparatus.

Cautiously, the United Kingdom Atomic Energy Authority reported "control of thermonuclear reactions for electricity generation may well be a possibility for the future."

ZETA (Zero Energy Thermonuclear Assembly) at Harwell produced what is believed to be thermonuclear neutrons. ZETA is a nine-foot toroid similar in principle to the "magnetic bottles" described in ELECTRONICS, Sept. 10, 1957.

Neutrons were observed when deuterium (heavy hydrogen) gas was heated electrically to five million degrees C. The hot gas was isolated for periods of two to five milliseconds, every 10 seconds. The cycle can be maintained continually.

British scientists can see no fundamental reason why longer pulses and higher temperatures cannot be obtained. Gas held several seconds at 100 million degrees, will be required to produce a power dividend.

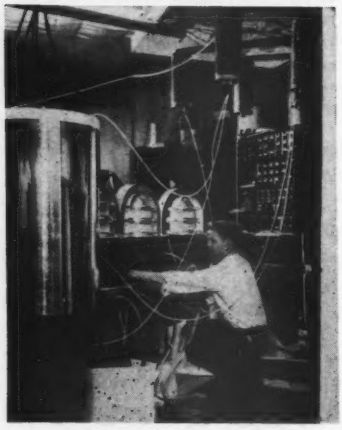
Heat is produced by passing current through the gas, setting up a magnetic field which pinches it. The instability of the pinch was overcome by a field outside the toroid.

Current up to 200,000 amp is passed through the gas. A practical reactor would have to produce a surplus of current, since some would be fed back.

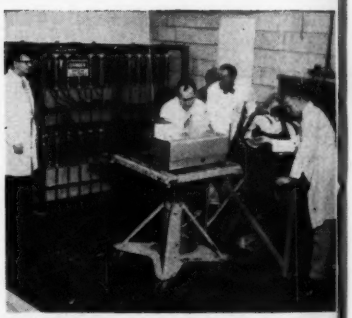
The heat causes nuclei of the deuterium to fuse, releasing energy and neutrons which can be converted into power, by conventional means or possibly electronic thermionic converters or fluctuations of the magnetic field.

Theoretically, one of these toroids could produce a million megawatts of heat, 100 times the energy input. Or it could be used as a breeder of uranium and plutonium for atomic fission reactors.

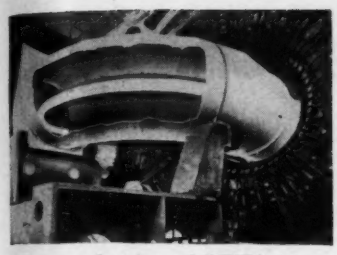
If implications in ZETA's success become a reality, the world's



Power discharge is big fusion problem. Technician works in spark gap testing room at Los Alamos



Perhapsatron, an AEC machine, is similar in operation to ZETA, but much smaller



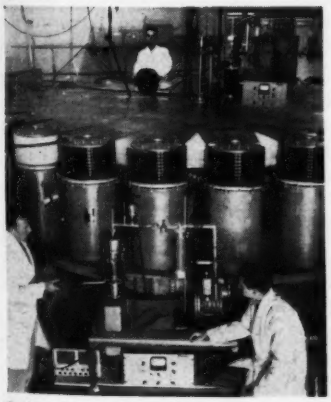
Cutaway drawing of ZETA in action shows how internal and external magnetic fields compress ionized deuterium in heart of torus

power problems could be solved for all time by the deuterium in common seawater.

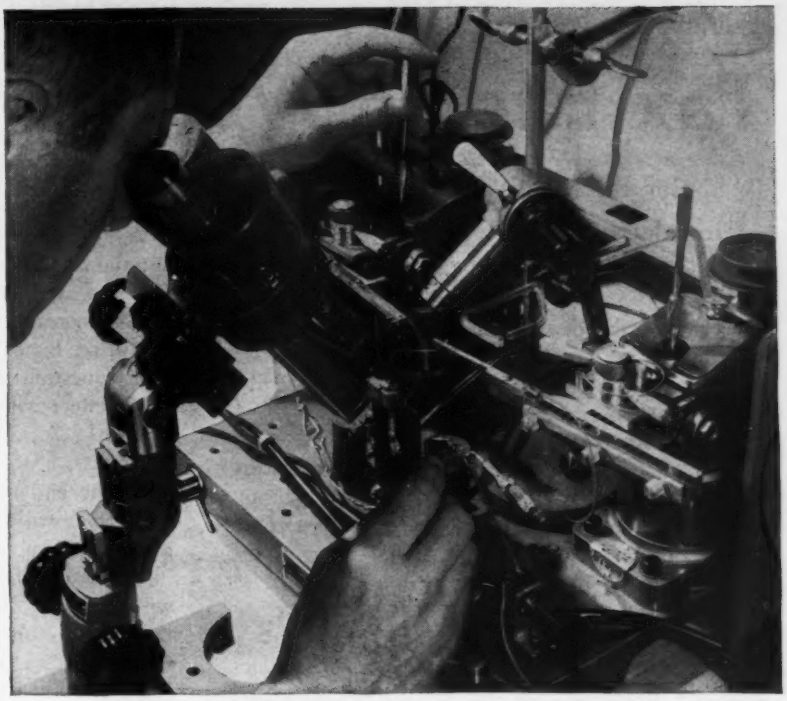
The U. S. has built several machines smaller than Britain's, as well as following several other possible fusion methods. Papers unclassified simultaneously with the British announcement indicate Los Alamos is not far behind Harwell. The Russians are also on the right track.

One obvious question posed by the prospect of fusion reactors is: will it kill substantial commercial interest in fission power, depressing a portion of the $35-50 million atomic instrument market?

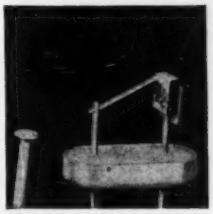
Britain announced its intention to go right on building five to six billion watts of fission power by 1966. AEC Chairman Strauss said fusion power is not yet as advanced as fission was on December 2, 1942, when the first chain reaction was sustained.



Columbus II, largest unclassified machine at Los Alamos, gets million-amp power from encircling capacitors. It has also produced neutrons at 5 million degrees C



3-D MICRO-VISION helps RAYTHEON develop new SPACISTOR amplifier



Spacistor shown next to ordinary pinhead.

The Spacistor, Raytheon's new semiconductor amplifier, opens new horizons in missile and communications equipment design. Still in development, the Spacistor promises to combine many advantages of transistors and vacuum tubes.

Viewed through a Bausch & Lomb Stereomicroscope, contact points that are normally barely visible can be positioned with hairline accuracy. 3-D magnification shows all parts vividly, right side up. Long working distance permits free movement of hands and tools between eyepiece and stage. Dustproof, shockproof optical system, with sharp, flat images free from distortion, assures fatigue-free viewing throughout prolonged examination.

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FOREIGN BUSINESS

Tax Effects Worry French

Current tax-hit tv sales are key to electronics industry's spending for future research programs

FRENCH ELECTRONICS manufacturers this month are watching extra closely the sales of their television sets. Current tv sales are the key to plans of the entire electronics industry for this year.

Manufacturers are fearful that new taxes will discourage tv set buyers, already harassed by the rising cost of living in France.

These new taxes, which will make both purchase and ownership of a tv set more expensive, are part of the government's austerity program designed to check inflation.

The electronics industry has found the situation thus far very discouraging. What makes tv set sales especially important, say the manufacturers, is that television profits are used to finance research and development in other fields.

On top of the 5½ percent hike in the sales tax on tv sets last fall (ELECTRONICS, Oct. 20), has come a further increase of 2½ percent.

In addition, the annual tax levied on all radios and tv sets has now been raised 33 percent.

For the French consumer this means that up to last month, he paid $3.60 a year on each radio and $10.70 on each tv set he owned. Now, as a result of the increases, he pays $4.75 on each radio and $14.30 on his tv set.

Big question for manufacturers is therefore: How much effect will the new taxes have on this year's tv sales? Some observers take a sales decline for granted.

By the end of this month, trade spokesmen believe, there will be some indication as to the general effect on French electronics of these latest government anti-inflation measures. But manufacturers will surely pay close heed to their tv sales reports in the months ahead before committing themselves to future research programs.

On another front, the French electronics industry is making ambitious plans. French Electronic Industries Association has announced that for the first time its 21st annual exhibition June 20-26 will be international in character. It will be held in Paris at the Parc des Expositions, Porte de Versailles.

DEVELOPMENTS ABROAD

• **Italian** tire manufacturer Pirelli Rubber Co. has developed electronic gear said to permit low cost testing of oscillating phenomena in auto tires and in rubber suspension systems. Machine, introduced recently in Milan, has 60 operating units, more than 1,000 tubes and extra parts for special testing operations.

• **In Britain** a new electronic timer has been developed by British Oxygen Gases Ltd. for a stainless steel spot welding process. Condenser relay timer was formerly used to time duration of weld, and an electromechanical timer controlled flow of argon used to cool the weld and prevent surface cratering and cracking of the fused zone. Firm says small, easily-serviced unit accomplishes both timing cycles with one tube.

• **Iraq** will soon have four radiosonde stations in operation gathering humidity, pressure and temperature data according to recommendations of the International Air Transport Association. Finnish 290-gram radiosondes are used.

• **In West Berlin** Telefunken GmbH is reportedly developing radar equipment that ranges over a 280-mi radius and 9.3 mi in height. Three such radars would cover all of West Germany's airspace.

• **British** 1958 National Radio Show to be held Aug. 27-Sept. 6 will include for the first time an audio section catering to the increased interest in hi-fi.

• **Russia** reports development of an infrared microscope for determining the homogeneity of semiconductor monocrystals and observing their flaws. Microscope was designed by Metallurgical Institute, Soviet Academy of Sciences.

EXPORTS and IMPORTS

Britain's Solartron Electronic Group and Consolidated Electrodynamics Corp. have signed a licensing agreement under which Solartron will manufacture and market CEC magnetic-tape recording and reproduction equipment. Gear records missile and aircraft flight-test data, then plays it back for analysis and interpretation.

Europe will buy American nuclear instruments that use only the latest electronic techniques, says Dr. Ernest H. Wakefield, president of Radiation Counter Laboratories of Skokie, Ill. RCL estimated foreign shipments for 1957 at $300,000, with export sales in the second six-month period 82 percent above those in the previous year.

In Australia the phonevision subscription tv system developed by Zenith Radio Corp. of Chicago

will be introduced within two years. System will be available only in Sydney and Melbourne at first. A $1.2-million company, Subscription Television Ltd. has been established following agreement between Zenith and Rola Co. (Australia) of Melbourne. Firm hopes eventually to provide attachments for all sets in Australia.

British firm Rediffusion Ltd. has signed a 21-year agreement with Skiatron International Corp. covering survey, installation, supervision and maintenance of cc-tv system in the Western hemisphere. Rediffusion will act as technical adviser to Skiatron with regard to equipment purchases and Skiatron will acquire 50 percent of the shares of Rediffusion Inc., Canadian subsidiary.

Argentina has received tenders for the sale of 55 state-administered radio stations that had been expropriated by Peron and welded into a propaganda chain. Also for sale is LR3-TV, the nation's sole tv station. The government is issuing rights to 10 tv channels, offering 15-year tv broadcast licenses; radio broadcast licenses run 10 years. Prospective buyers must invest 500,000 pesos minimum, about $13,150 at the free market rate currently around 37-1.

In Pakistan a 635-mi radiotelephone system from Karachi to Multan has been completed for the Sui Gas Transmission Co. of Pakistan. System's first part was installed 3 years ago by Pye Telecommunications and Ericsson Telephones Ltd. of England. Now, Pye has completed an extension of this which provides three speech and two teleprinter channels. When the pipeline is ready, the system will provide control instructions for regulating gas flow.

In Britain the U. S. Air Force has ordered $220,000 worth of telegraph distortion measuring sets and electronic regenerative repeaters from Automatic Telephone and Electric Co. This is in addition to previous orders for telegraph gear from the British firm.

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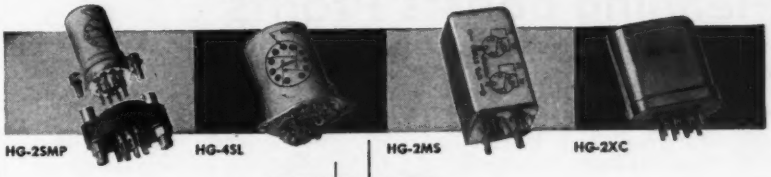

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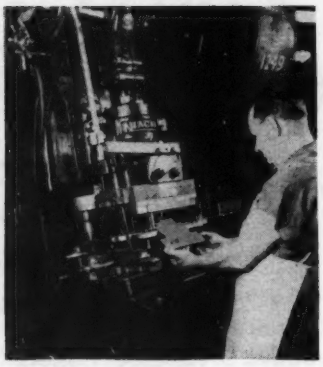


Planning Boosts Profits

THREE-PRONGED PLANNING program that paved the way for a big pickup in earnings of General Instrument Corp., Newark, N. J., is spotlighted in its recently released nine-months earning statement.

GI is one of the nation's leading component manufacturers, an important producer of silicon rectifiers and diodes, capacitors, i-f transformers, tuners and deflection components.

The latest statement reports net profits of $551,527 for the nine months ending Nov. 30, a 63 percent boost over the $337,146 earned in the same period last year. Moreover, the earnings gain was made despite a slight dip in sales, from $25,398,628 to $25,271,168.

Earnings for the full year, ending Feb. 28, which include figures of its latest acquisition, Radio Receptor, should be substantially higher than the $505,407 earned last year. Profits for the first three quarters already exceed earnings for the entire past year by nine percent.

A change in the product mix, establishment of integrated manufacturing and decentralization of executive responsibility were the chief factors in the program which led to improved profits, explains Moses Shapiro, executive vice-president.

Most significant step was the introduction of silicon rectifiers to the product line in 1955. The firm's position in semi-conductors was strengthened by the purchase last April of Radio Receptor, which added semiconductor manufacturing facilities and silicon diodes to the product line.

In 1954 about 90 percent of GI's business came from radio and tv manufacturers. Today, 25 percent of its business comes from military and industrial users, primarily because of the addition of silicon rectifiers and diodes.

By 1959, GI hopes to achieve the balanced sales base it is shooting for—half entertainment, half military and industrial.

Consequently, instead of being almost wholly tied to the sagging entertainment electronics business, an increasing share is coming from the ever-growing military market.

Integrated manufacturing, a policy of making the whole component from raw materials to finished product (see pictures), also got started in 1955 when GI merged with Automatic Manufacturing Corporation. For instance, GI makes its own tin cans and stampings and molds its own ferrites. Merger with Automatic brought machinery and equipment needed for integrated manufacturing, plus executives like Benedek and Shapiro whose thinking was in this direction.

This policy has lowered costs through eliminating supplier profits. Orders move quicker along the production line because they don't get held up by material shortages. Also, GI is in a better position to handle special order requests from customers.

Final step of the program was decision in Dec. 1956 to decentralize responsibility for operation of its seven U. S. factories. Factory managers were given complete profit and loss responsibility for products manufactured at each location. Change resulted in greater efficiency of operation through top management's ability to pin-down responsibility for success or failure.

Booth to Head M-H Division

APPOINTMENT of John G. Booth as general manager of the Davies Laboratories division of Minneapolis-Honeywell Regulator Co. is announced. He succeeds Gomer L. Davies, founder of the Beltsville, Md., firm acquired by Honeywell in 1956. Davies will serve as a consultant to the division.

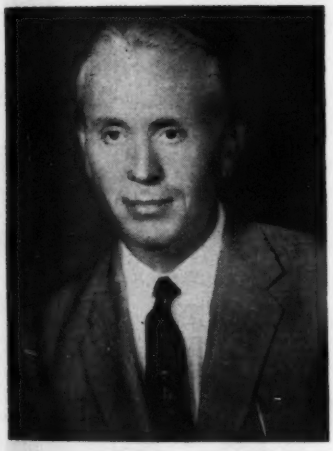
Booth was manager of the industrial division's systems engineering department. He directed its organization in 1955 to advance Honeywell's interests in data handling and control systems for atomic reactors, electric power generation and distribution, and systems of an advanced and special nature.

Elect Spencer Senior V-P

RAYTHEON Mfg. Co., Waltham, Mass., elects Percy L. Spencer (picture) senior vice president. Spencer joined Raytheon in 1925 at the time of its formation and pioneered

in the development of the company and its products. He has headed its microwave and power tube division since early World War II and was elected a director of the company in 1955.

While Spencer will continue to serve as manager of that division, his election to the new post will make his broad operating experience available to all manufacturing divisions. Among his technical achievements are contributions to the development of tubes required for proximity fuses, as well as the perfection of techniques which greatly extended the life of magnetrons and made it possible to adjust them to specific frequencies.



Name Pelfrey R&D Director

ACTIVE in the development program at International Rectifier Corp., El Segundo, Calif., since 1953, Lowell S. Pelfrey (picture), is named director of research and development.

At International Rectifier, Pelfrey performed much original and valuable work in the purifying of germanium and silicon, and in the production of single crystals of these materials. His developments have led to the introduction of several new devices, such as high temperature germanium diodes, germanium mixer diodes for television, and several types of silicon diodes for radar.

Under his direction the R&D group will continue its develop-

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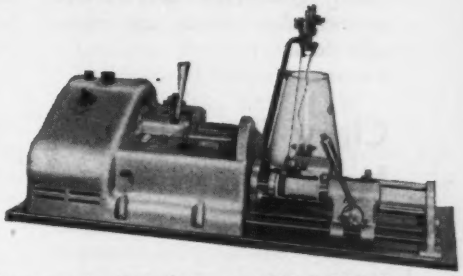
Gearless BOBBIN WINDER
Adjustable Winding Length



Gears eliminated by new pitch selector; no gear changing between jobs required. Merely set selector lever at desired pitch and wind all types of random wound bobbin coils, solenoids, repeater and relay coils up to 2" OD using 27 to 46 gauge wire.

66-700 turns per inch winding range. Speeds up to 8000 RPM obtained by direct drive between motor and spindle. Fine wire breakage prevented by 3-second slow-start which is dialed in or out as needed. 3½" max. traverse for any single continuous winding. Winding traverse infinitely adjustable between ⅛" and 3½". Max. loading distance for multiple winding 8½". Output end of spindle ½", flatted shaft.

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FREEDOM IS NOT FREE!

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ment of high, medium and low power germanium and silicon rectifiers, Zener diodes, and silicon solar cells.

Clary Sets Up New Department

To MEET the challenge of the space age for increasingly close tolerances and precision workmanship, Clary Corp., San Gabriel, Calif., has established a central quality control department.

Louis M. Buhler is named head of the new department which will be in direct charge of quality control for Clary's complete line of business machines as well as its rocket and missile components. For the last two years he was chief inspector for the San Gabriel plant.

Name Le Nay V-P at Perkin

THOMAS W. LE NAY (picture), chief development engineer of Perkin Engineering Corp., El Segundo, Calif., is appointed vice-president of the corporation. He has been with Perkin for approximately 5 years, and has been responsible for many of the major new product developments of the firm in the field of tubeless magnetic amplifier regulated d-c power supplies and a-c line regulators.

He was previously associated with Duncan-Hunter Co., makers of battery chargers, and Gilfillan Bros. Inc., in the radar design department.

IBM Advances Lab Manager

JOHN W. Haanstra (above) is appointed assistant manager of product development in charge of all development programs for International Business Machines Corp., and will move to data processing division headquarters at White Plains, N. Y. Previously he was manager of basic development at the company's product development laboratory, San Jose, California.

Haanstra joined IBM in 1950. He was assigned to the San Jose lab in 1952 and worked on analog to digital conversion devices and in-line data processing systems. In 1954 he was named to head system planning work there on design and development of the RAMAC data processing system.

A-C Promotes

ALLIS-CHALMERS Pittsburgh Works upgrades William H. Mutschler, from patents and standards engineer to the post of chief engineer. He succeeds W. M. Terry, Jr., named director of engineering coordination for the company's Industries Group.

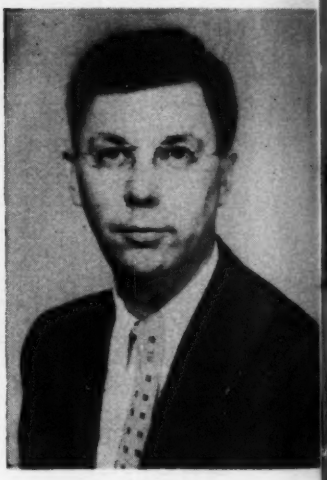
George Gallousis, with A-C for ten years, is upped to patents and standards engineer, succeeding Mutschler.

CCC Settles In Connecticut

CONSOLIDATED Controls Corp., a subsidiary of Consolidated Diesel Electric Corp., has contracted for office and plant facilities in Bethel, Conn., with full-scale operations at the site due by mid-February.

The Bethel property, leased by Consolidated Controls, covers approximately three acres. Office and plant facilities, now being enlarged, will occupy initially approximately 16,000 sq ft; with provision for expansion to 40,000 sq ft expected to be undertaken at an early date.

The business to be acquired by Consolidated Controls consists in the development and manufacture of control systems for missiles, aircraft and nuclear power plants.



Talamini Joins Electro Tec

APPOINTMENT of A. J. Talamini Jr., (picture), as director of engineering for Electro Tec Corp., South Hackensack, N. J., is announced.

Talamini recently resigned from the A. B. DuMont Laboratories as chief engineer of the technical products division. His work has covered oscillography, instrumentation, radar, commercial and military television, communications equipment and similar electronic areas. Prior to that he was associated with Federal Telephone and Radio Corp. doing radar and communications

development work during the war years. Before the war he was with Kolarama Laboratories doing development work on large screen television.

Elect Lehr R&D V-P

NEWLY elected vice-president in charge of research and development at Dictograph Products Inc., Jamaica, N. Y., is Philip N. Lehr (picture). For several years he has been director of engineering and a member of the board of directors. Previously, he held the position of chief engineer.

The company's products include intercommunication systems, hearing-aids, and various communication systems used by the government.

Estey Heads Engineer Group

DESIGNATION of Roger S. Estey as head of the Advanced Engineering Section of the Western Subsystems Division of Servomechanisms, Inc., is reported.

In his new position Estey supervises the activities of Servomechanism's engineers engaged in the development of complex electronic and electromechanical sub-systems for manned aircraft and guided missiles which are presently on the drawing boards of companies.

Prior to his present position he was supervisor of the infrared group in the engineering department of Servomechanisms and a research physicist. Previous connections include v-p for R&D of Borman Engineering, Inc.; head of the consultant group of the U. S. Navy's Bureau of Ships, Spencer Lens Co., and Electrical Testing Laboratories.

Helwig Becomes V-P at Kaar

IN Palo Alto, Calif., Norman C. Helwig (picture) is elected vice president of Kaar Engineering Corp. He has been general manager of the electronics firm since 1952

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ELECTRONIC SEMICONDUCTORS

Just Published. A rigorous and systematic introduction to semiconductor physics, developing the subject logically from simple concepts and giving clear pictures of the conduction mechanism of electronic semiconductors within the framework of the *band model*. Among the book's outstanding features are the treatment of acceleration of electrons, the Zener effect, etc. Book is a translation of the 2nd German edition of *Elektronische Halbleiter* by **Eberhard Spenke.** Translated by **D. Jenny, H. Kroemer, K. G. Ramberg,** and **A. H. Sommer,** RCA Laboratories. **430 pp., 163 illus., $11.00**

RANDOM SIGNALS AND NOISE

Just Published. An introduction to the statistical theory underlying the study of signals and noises in communications systems. Contains an introduction to probability theory and statistics, a discussion of the statistical properties of the Gaussian random process, a study of the results of passing random signals and noises through linear and nonlinear systems, and an introduction to the statistical theory of the detection of signals in presence of noise. **By William B. Davenport, Jr.,** and **William L. Root,** Lincoln Laboratory, M.I.T. **393 pp., illus., $10.00**

NUMERICAL ANALYSIS

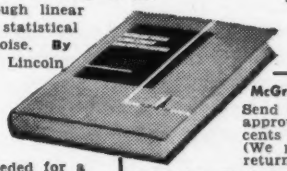
Just Published. Covers the topics most directly needed for a clear understanding of methods used in numerical solution of differential equations, both ordinary and partial, and in the solution of integral equations. Clearly explains the use of finite-difference methods in obtaining numerical solutions to problems—emphasizing procedures which can be most readily programmed for an electronic digital computer. Many helpful techniques such as the use of lozenge diagrams for numerical differentiation and integration are supplied. **By Kaiser S. Kunz,** Ridgefield Research Lab. **381 pp., 40 illus., $8.00**

ELECTRON TUBE CIRCUITS

New 2nd Edition Just Published. Discusses and evaluates the fundamental properties of electron tubes and their circuit operations—analyzes tuned and untuned amplifiers—and takes up in detail circuits essential to modern electronic systems such as voltage, video, and power amplifiers; waveform generators; oscillators; modulators, etc. Scores of practical examples show you best applications of theory. **By Samuel Seely,** Case Inst. of Technology. **2nd Ed. 695 pp., 739 illus., $10.50**

BASIC FEEDBACK CONTROL SYSTEM DESIGN

Just Published. Bases the study of feedback control system design on complex frequency plane analysis—the root-locus. A wide range of servo transducers and components are covered. Recent advances covered include a section of gyroscopes and force-balance transducers, inertial navigation; analysis of nonlinear systems such as the describing function technique and phase plane analysis. Frequency methods, such as Nyquist and Bode, are included. **By C. C. Savant,** U. of Southern Cal. **418 pp., illus., $9.50**



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and will continue to function in that post.

Helwig's promotion came on the heels of a report that 1957 was the radiotelephone equipment firm's best year. "Our 22-year sales record was achieved without defense business" he said, pointing out that commercial business was predominant and that government business consisted of sales of commercial products to civilian agencies of the government.

Beard to Head Rotron Sales

APPOINTMENT of Paul M. Beard (picture) to the newly-created position of director of sales for the Rotron Mfg. Co. of Woodstock, N. Y., is announced by J. Constant Van Rijn, president. To take the new post, Beard resigned from Aerovox Corp., New Bedford, Mass., where he has been sales manager.

Rotron, founded in 1949 by J. Constant Van Rijn (a native of Holland), and five employees, now employs over 300 people and serves the electronic, missile, aircraft and nuclear industries with its air movement devices.

Form Nationwide Job-Pool

EFFORTS to establish the first national manpower pool of experienced scientists and engineers got underway last Friday.

Careers, Inc. of New York City on Jan. 31 mailed an appeal for basic employment data to 100,000 engineers and scientists with one to 15 years experience and who are interested in new jobs.

About 6,000 men are expected to supply data on themselves and become part of the National Manpower Register which Careers, Inc., will establish.

Here's how the register will work:

Let's say an electronics company wants to hire four microwave specialists with M.E.'s in electrical engineering, with 5-10 years experience, making between $10-12,000, and living within 100 miles of its research laboratory.

Punched cards containing basic data on all 6,000 men will be turned over to an IBM 407 for a quick sort and readout. Within 48 hours the company will get a list and brief summary of all men in the register who fill its bill.

The register is expected to benefit participating companies by speeding up the man-finding process and reducing recruitment costs.

It will enable job-seekers to keep on top of the hiring needs of 100 companies participating in the project. Some 75 percent of these firms employ electronic engineers, says William A. Douglass, youthful president of Careers, Inc.

Douglass has been doing a similar mass-sifting job with graduates of colleges and engineering schools for eight years.

He claims interest in engineer recruitment is as strong as ever. He admits many companies have recently cut down on engineer hiring. But he also found that 120 out of 200 companies, surveyed by his firm, had not reduced recruiting efforts. Many technical personnel managers of electronic companies told him the present soft hiring market is temporary. They are building up their list of prospects to be ready for quick action when operations again expand. Some personnel managers said good men were as hard to find as ever.

Airtron Adds Two Plants

APPROXIMATELY 40,000 sq ft of floor space in two separate buildings in Linden, N. J., have been added to the already existing five plants of Airtron, Inc.

Through their joint efforts, the company's seven plants, one in Cambridge, Mass., the others in Linden, now in full operation and employing approximately 1,000 people, are forging ahead to set new production goals that will contribute to the advancement of the growing microwave electronic and aircraft industries.

Microdot Names Sales Manager

PROMOTION of Guy Martin (picture) to the post of sales manager at Microdot, Inc., South Pasadena, California, manufacturer of miniaturized coaxial cables, connectors and components, is announced.

Martin, who has been assistant sales manager of the electronics firm for the past year, was formerly a sales engineer with Fansteel Metallurgical Corp.

Two Move Up At Motorola

IN Chicago, Ill., Motorola Communications and Electronics, Inc., promotes Homer L. Marrs to the post of vice president and operations manager. He was v-p and midwestern sales manager for the past two years, prior to which he was regional sales manager. He entered the firm's communications equip-

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ment sales engineering activity shortly after joining the company in 1938.

Succeeding Marrs as midwestern sales manager is Harold A. Jones, formerly staff director of sales. Jones' appointment follows 11 years of experience with the company in various engineering, advertising-sales promotion and sales management capacities.

Jersey Firm Relocates

AD-YU Electronics Lab. Inc., formerly Advance Electronics Lab. Inc., moves to a new, larger building at 249 Terhune Ave., Passaic, N. J.

The company manufactures phase and time measuring instruments, variable and fixed delay lines and electronic counters, in addition to custom designed electronic instruments and components. A trained staff of skilled engineers has been made available for consultation.

Zenith Elects Kinney V-P

THE BOARD of directors of Zenith Radio Corp., Chicago, Ill., has elected Eugene M. Kinney (picture) vice president in charge of the hearing aid division. Since January of this year when he was appointed assistant general manager, hearing aid division, he has

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been the supervising coordinator of a five-man staff responsible for the division's sales, service, administration and advertising activities.

IBM's Critchlow Gets New Job

ARTHUR J. CRITCHLOW (picture) of the San Jose, Calif., Research Laboratory of IBM Corp., is named manager of applied research there. He was formerly senior engineer of photometry and photochemistry programs at the laboratory.

In his new duties he will act as liaison between the San Jose lab and the scientific community to identify new knowledge of special interest to IBM. He will be responsible for exploring applications of new devices, machines and systems for ultimate use in IBM products.

Plant Briefs

SHREWSBURY, Mass., will be the new home of the **Phalo Plastics Corp.** The one-story building with 110,000 sq ft of space is scheduled for occupancy early this year.

Aero Gear & Electronics Corporation is formed in Burlington, Mass. Firm headed by T. W. Khiralla and retired MIT Professor Earle Buckingham makes gears and electromechanical components for electronics industry.

Pyramid Instrument Corp., Lynbrook, N. Y., has formed a new division, the Sargent Electric Corp.

News of Reps

HILL Transformer Co. Inc., San Carlos, Calif., appoints **Osborne Electronics Corp.,** Hawthorne, Calif., to handle sales of special-duty transformers in the electronics field.

G. S. Marshall Co., San Marino, Calif., rep organization, adds Walt Johnson and Roy Petre to the component division and Hugh Mitchell to the instrument division.

Cable and Systems Engineers Inc. of Westwood, Calif., is being retained as western reps for Resdel Engineering Corp., Pasadena, Calif. The new rep firm will sell for Resdel in all states west of the Mississippi.

Standard Components, Inc., Mt. Vernon, N. Y., is appointing reps to merchandise its deflection component line. Reps named and territories already assigned are: **Jack Jacobs,** covering Delaware, Pennsylvania, southern New Jersey and Maryland; **Ed Berliant,** upper New York State; **William Goldman,** New England; **Ben Pinz and Jay Friedman,** metropolitan New York and northern New Jersey; and **Fred A. Rosenwasser,** Ohio, Michigan and western Pennsylvania.

Eltron Engineering Sales Inc., Newtonville, Mass., is appointed to handle the products of three firms: Hyperion, Inc., West Newton, Mass., manufacturer of transistorized power supplies and converters; Electro-Physics Laboratories, San Marino, Calif., maker of subminiature coax connectors; and Industrial Electronic Engineers, North Hollywood, Calif., in-line digital readout manufacturer.

McDowell Redlingshafer Sales Co., Kansas City, Mo., rep will cover Missouri, Iowa, Kansas, southern Illinois and eastern Nebraska, in handling the component line of General Instrument Corp. subsidiary, Radio Receptor Co., of Brooklyn, N. Y.

INDEX TO ADVERTISERS

American Machine & Foundry Co. 32
Barnstead Still & Demineralizer Co. 8
Bausch & Lomb Optical Co. 47
Borden Company, Resinite Dept. 31
Bruno-New York Industries Corp. 10
Clevite Transistor Products 7
Electronic Systems Engineering Co. 46
Hermetic Seal Transformer Co. 45
Hewlett-Packard Co. 4
Hi-G Inc. 46
Hycon Eastern Inc. 33
Kearfott Co. Inc. 42
Kennedy & Co., D. S. 12
Leach Corporation 11
MacDonald Inc., Samuel K. 55
Martin Co. 36, 37
McGraw-Hill Book Co. 53
Monsanto Chemical Co. 15
North Electric Co. 24
Phalo Plastics Corp. 9
Radiation Inc. ..... 3rd Cover
Radio Corporation of America ..... 4th Cover
Raytheon Mfg. Co. ..... 2nd Cover
Sigma Instruments Inc. 2
Stevens Mfg. Co. Inc., George 5
Tung-Sol Electric Inc. 6
Westinghouse Electric Corp. 1
Worklon Inc. 4

PROFESSIONAL SERVICES 53

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 53
SPECIAL SERVICES 53